The
Electrical Review

VOL. CXXI OCTOBER 29, 1937. No. 3127

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Classified Advertisements—Official Notices—Tenders—Supp. 19.

Index to Advertisers—Page xlii.

Principal Contents:

	PAGE
The Warsaw Suburban Electrification	589
Growth of Telegraph and Telephone Services	592
Small Motor Applications. By "Contact"	593
Steelworks Control Gear	594
Fulham Maternity Home	595
Oil Circuit-breakers. By R. T. Lythall	597
Notes from Canada	599
Electricity Supply Salesmanship	600
Meetings and Discussions	601
Electricity in the Dairy	602
New Apparatus and Devices	603
Trolley-bus Developments	605
Business and Industrial Notes	606
Electricity Supply	611
Contract Information	614
Notes	615
Our Personal Column	616
Financial Section	617
Published Specifications	621
New Work for Contractors	622

Good Communications

THAT telephony and telegraphy have made spectacular advances in recent years is a truism, but there are many people, even in electrical circles, who have little idea of the causes of the improvements or of how far they are likely to continue. They know only that, of late, the service has been extended to remoter districts, that clearer conversation is obtained over longer distances, that reliability has increased, that charges have been lowered and that the Post Office has shown much more inclination to take account of the wishes of subscribers.

Essential information on the technical aspects of public communications formed the main theme of the presidential address to the Institution of Electrical Engineers last week, when Sir George Lee dealt with a subject of which he is a master against the broad background of the unselfish sharing of knowledge and the close association of people interested in different branches of engineering that is a great part of the tradition of the Institution.

While the field more especially covered by the address is of itself a wide one—Sir George is responsible for directing the work of some 30,000 persons—there was much in it that finds parallels throughout the engineering world. Thus, supply engineers can profit from the experience of one who is in the special position of being able to co-ordinate data drawn from an immense number of cases in which he is directly concerned.

Especially to the point was the relationship he established between various factors making for telephone development. Here was a demonstration of the actual effects of research in lowering costs and of the consequently lowered charges in increasing connections, enabling new and improved plant to be installed immediately upon its becoming available instead of waiting for the normal workings of obsolescence. This policy again has resulted in reduced costs and so further enlarged the number of users—the circular motion being continuous and likely to be so for a long time.

Something more than low prices are needed, however. The rates must be in a form attractive to the user, and the two-part tariff with free calls "given" in with the fixed component has evidently met with public approval, while the low night charges for trunk calls have succeeded beyond the "wildest expectations." The latter have also raised the load factor—a vital matter with telephones, as the costs of this service (in which it differs from telegraphy) are largely standing charges.

In this respect also the position is comparable with that of electricity supply, as it is again in the methods adopted for development forecasting, which are related to tariffs and to anticipated economic conditions. Long term planning for as far ahead as twenty years is the rule, with revisions every five years as the situation may require.

As the President very truly said, a guess based upon carefully tabulated information is more likely to be near the mark than one made without study. He has found underforecasting just as wasteful as overforecasting—perhaps a conservative way of putting it, since the effects of research are, as he implies, likely to stimulate growth in all kinds of unexpected ways.

Automatic working has proved not only quicker but also more reliable than manual operation, which applies also to other engineering work, but we do not know of anything elsewhere that is quite on the lines of the "automatic routiner" that tests in turn every item in an equipment, including insulation, for all fault conditions.

These are but a few of the more obvious illustrations that may be drawn from the presidential address of the similarity of problems that confront engineers whose function is—as Sir George concisely expressed it—to relate the many-sided activities of research to the creation of a public demand and to satisfy it at reasonable cost.

The New Electricity Bill

He would be a bold, almost a reckless, man who would attempt to prophesy what will happen in Parliament during the coming session regarding new electricity supply legislation. The forecasts in the daily Press have not been such as to lead the public to believe that there is any enthusiasm or urgency. At the moment we suppose that only a few people know what is being planned behind the scenes. In due course members of Parliament will be acquainted with the terms of the Bill that is being prepared for the Minister of Transport and it will be possible for electrical men to discover how far the Government officials have been able to reconcile the views already expressed by various interests concerned. Unless we mistake the situation very much, members of Parliament will need a good deal of educating before they are suitably equipped for giving a definite vote on a problem which has become so complex. Electrical men might be unanimous about what is best for the industry and, in their opinion, for the nation as a whole, but they do not constitute the Legislature. There are other interests who will expect to make their voice heard in Parliament, and it may become the duty of the individual member, devoid of specialised knowledge, to exercise his vote according to principles. What the exact principles will be will doubtless be indicated by some form of lead from the Government, but the Opposition has an electrical policy of its own, concerning which something is sure to be heard. Parliament has many things in hand; if it has time to reach electricity we may be sure, at least, of an interesting electrical session.

The Canadian Market

What is likely to be the future value of the Canadian market to British electrical manufacturers and traders? This is one of the oldest of our export trade problems. Innumerable have been the individual and collective efforts that have been made to establish substantial connections at suitable centres across the vast expanse; experts have contributed hundreds of articles or reports which have been published in the Electrical Review urging that more attention be paid to the market; trade associations and engineering institutions have had their peculiar opportunity put before them; and manufacturers have been advised to adapt their products to Canadian needs and conditions. And still, in spite of all, our special correspondent who has been stationed in the field for many years, writes to us even now in a spirit of despondency. Certain overseas markets which have been under clouds of depression for a long while are now developing electrically at a greater rate again and Canada is among them. Indeed it is because there are great expectations there just now that our contributor returns to the matter on page 599 of this issue.

Recent Improvement

What has been happening during the last year or two in the Dominion was recorded in the statistical return and commentary on Canadian electrical production and statistics which appeared in our issue of July 30th last (p. 153). The year 1936 was the best experienced for some time by the electrical industry throughout Canada, for she took United Kingdom exports to the tune of £250,000 as against £183,000 in 1935 and £131,000 in 1934, while in 1935 she also increased the production of electrical apparatus in her own home works by 20 per cent. over 1934, and by 65 per cent. over 1933. These figures make very encouraging reading and may seem not to justify our correspondent's forebodings, but as a matter of fact what is really in his mind is the question whether we in this country are fully alive to the great opportunity that is now opening out. In a covering letter to us he indicates that the sky has become much clearer than for a long time past, and that the period of stagnation has ended. British manufacturers must get into good form if they are to share in the business that is coming.

The Toronto Exhibition

Next year the Canadian National Exhibition in Toronto celebrates its sixtieth anniversary. From this event in the past British electrical exhibits have generally been conspicuous for their absence. It is believed that if they pursued a more active policy on this occasion they would boost our export figures. The classes of goods in which we increased our trade with the Dominion in 1936 were dynamos, batteries, lamps, motors and parts, transformers and turbo-generators. Our correspondent fears that the vastness of the territory and the smallness of the population incline British electrical manufacturers to take too little interest in the market. We find it difficult to believe that their eyes are closed to what is happening when we recall the emphasis which they place upon the necessity for reaching record export trade figures during the next few years.

Switchgear Performance

The new edition of the British Standard Specification, which is reviewed by Mr. R. T. Lythall in this issue, covers circuit-breakers for 3,300 V and upwards. It is now appreciated that conditions which apply to the higher voltages do not necessarily apply to the lower voltages, particularly those at or about 400. It is at this voltage that the majority of industrial breakers are used, and the conditions under which this type operate are such as to warrant further detailed consideration and possibly an entirely separate specification in due course. The importance of this point lies in the fact that the recommendations in this 1937 edition concerning short-circuit testing cannot necessarily be applied to breakers at low voltages. The foreword of Part I states that the 1929 issue may be applied to such breakers pending any new issue. The new edition represents a big advance and some time must be allowed before every circuit-breaker can be certified to comply with the new requirements in all respects, but no doubt compromises can be made to suit individual cases in the meantime.

The Sales Side

The discussion on salesmanship arranged last week by the London Technical Group of the Electrical Power Engineers' Association is another indication that the E.P.E.A. is endeavouring to equip its members to meet the changing conditions in the electricity supply industry. Even if power engineers do not have to become salesmen themselves, they must know what is required to efficiently sell the power which they so efficiently produce. No longer can the supply station man afford to view with disdain the "commercial" side of his business—indeed, he never could, but the point has recently become much plainer.

Light Conduct at Southend

Years ago it was said that one arc lamp was worth two (or was it ten?) policemen. If such things follow a straight-line law, the illuminations of a seaside town should be equivalent to a fair-sized police force. And yet at Southend, brilliantly lighted as it is, a councillor was able to say that visitors to the town cause great annoyance to the residents and that there had been scenes which were "beyond description." That "something in the seaside air" seems to be intensified by a superabundance of light, causing visitors, as well as the town, to get "lit up."

Wry Humour

In the course of some remarks in the *Radio Times* A. A. Thomson says:—

> "I have been wanting electric lighting in my cottage for years, but the local supply company won't bring it along. I don't mind this so much. What peeves me is that they always send their weekly letter of refusal in an envelope marked 'Use More Electricity.' What some people want is tact."

This recalls the Mad Tea Party at which Alice was asked if she would have some more tea. She indignantly said that she had had none so far, to which the Mad Hatter replied that that being so she could not very well have less.

The Warsaw Suburban Electrification

An important international link

A large quantity of British electrical equipment has been supplied for this £2,000,000 scheme

In its origin the electrification of the Warsaw suburban railways was due to the difficulties occasioned by the existence of four terminal stations, two on each side of the Vistula, the only connection between which was a long loop line. Each station served its own suburban area, while the Central station, in addition, dealt with main-line express trains. There was thus no through suburban transport in the city, and terminal operation was consequently unduly heavy.

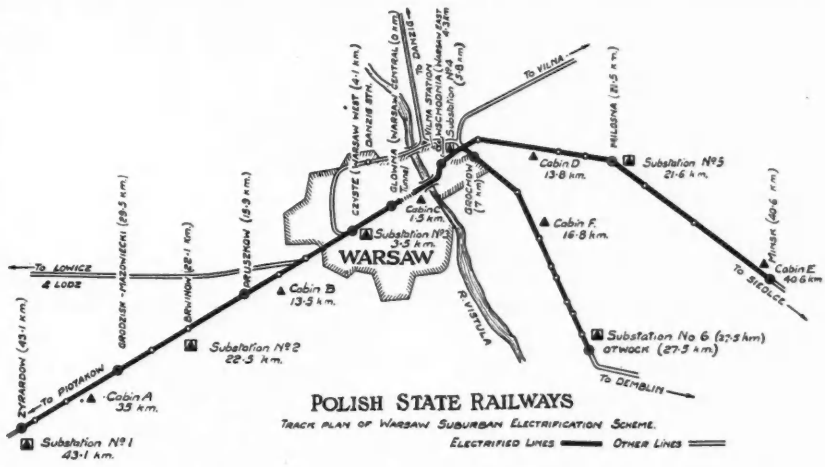
Warsaw, with a population of 1,300,000, is not only the capital of Poland but is also on a principal traffic route between the U.S.S.R. and Western Europe, and this emphasised the need for through-running facilities. In order to provide these it was decided to construct a tunnel under part of the city to the west of the river, and problems of ventilation called for a solution by electrifying the new railway link. Electrification of so short a route as 4¾ miles has drawbacks on both financial and operating grounds, but it was found that local traffic density was high enough to justify a larger scheme that involved electrification to a radius of about 25 miles from the city.

Service on the through route and part of the suburban system was officially inaugurated last December, and the first stage of the scheme is now nearing completion. This covers, in addition to the through line, three major lines radiating from the City to Zyrardow (27 miles), to Minsk (25 miles), and to Otwock (17 miles).

The capital expenditure involved in the contract entered into by the Polish Ministry of Communications in August, 1933, amounted to approximately £2,000,000 sterling, of which about half was spent in Poland. The main contractors were the English Electric Co. and the Metropolitan-Vickers Electrical Co., and their responsibilities included the provision of six rectifier sub-stations (three by each company), six 2,200-h.p. locomotives, electrical gear for seventy-six three-coach trains and four switching locomotives, and overhead line construction. The last-named work has been carried out by British Insulated Cables, Ltd., acting as principal sub-contractor. The switchgear and much of the accessory equipment have been supplied by Polish sub-contractors.

Energy is delivered to the sub-stations from the 35-kV three-phase 50-cycle network fed from Pruszkow and Warsaw power stations, which run in parallel and have a combined capacity of 143,000 kVA. One sub-station contains three 2,500-kW 3.3-kV mercury-arc steel-tank rectifiers, three contain two similar units each, and the others two of 2,000 kW capacity each. Overloads of 25 per cent. for fifteen minutes and 200 per cent. momentarily can be coped with by the rectifiers.

The 35-kV feeders are taken to outdoor steel structures,



POLISH STATE RAILWAYS

Track plan of Warsaw Suburban Electrification Scheme.

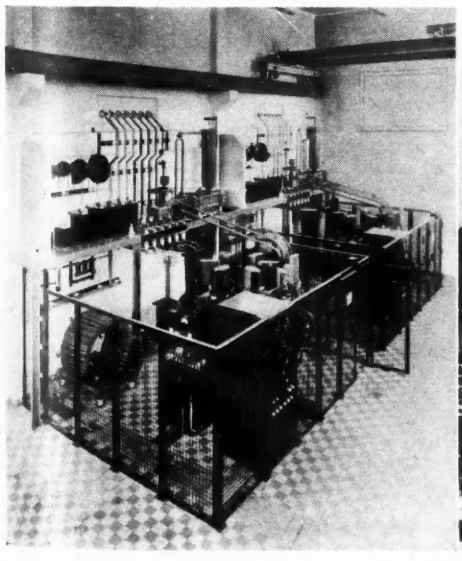
Electrified Lines ——— Other Lines ═══

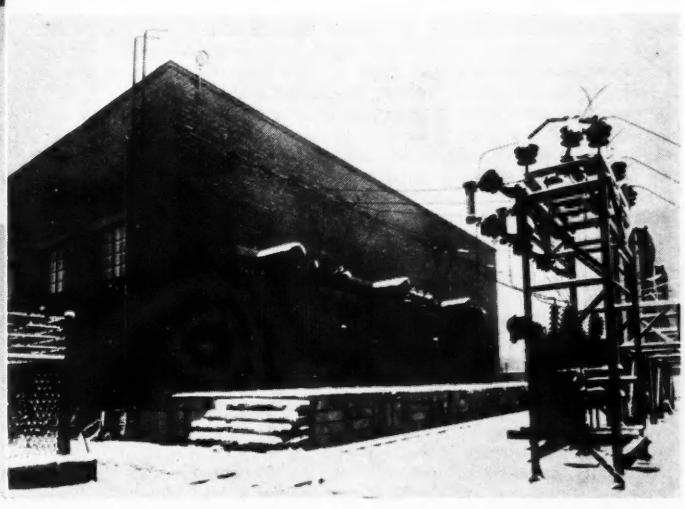
where they are connected to isolators, arrestors, and potential and current transformers and thence to 500,000-kVA oil circuit-breakers and bus-bars.. From the latter leads are taken through isolators and circuit-breakers to the outdoor self-cooled rectifier transformers. The housing of the outdoor controls of these breakers encloses an electric heater to provide against low ambient temperatures.

Protection of the incoming feeders is afforded by impedance-time (distance) relays with earth leakage indication only, as the system neutrals are earthed through arc-suppression coils. Tripping of the rectifier breakers is effected by overload relays with inverse time-limit characteristics and by relays that operate instantaneously on short circuit.

The rectifier transformers have star-connected primaries and six-fork delta secondaries; they have also a tertiary six-phase star winding each for baking out. The rectifiers are cooled by water passing through the jackets, cathode and anode plates; the water is pumped through recoolers, the air blast for which is controlled by a thermostat in the rectifier water system which cuts the fan motor in or out.

A Pirani gauge operates a relay for switching in or out the mercury-vapour high-vacuum pumps and the self-cooled rotary





Left: The interior of No. 4 sub-station. Right: Typical transformer for a 2,500-kW rectifier

low-vacuum pumps according to the vacuum in the rectifier. As the high-vacuum pump may be running when the rectifier is out of service, it has a smaller independent air-blast recooler.

The guaranteed efficiencies of these rectifiers, including transformers and auxiliaries, at various loads are as follows:—5/4, 96.07; 4/4, 96.6; 3/4, 96.82; 2/4, 96.72; 1/4, 95.57, but these figures are stated to have been appreciably improved upon on test. The Met.-Vick high-speed breakers installed between the cathode and the d.c. bus-bars are designed for reverse-current tripping; those on the outgoing d.c. feeders embody auto-reclosing and forward overload tripping.

Voltage ripple is maintained at a r.m.s. value of less than 1½ per cent. of the normal d.c. voltage by smoothing equipment comprising a series reactor in the cathode lead and four resonant shunt circuits connected between the positive and negative poles of each rectifier. A resonant circuit consists of a condenser and small reactor tuned to resonance at 300, 600, 900 and 1,200 cycles, and protected by high rupturing capacity fuses. For supplying the sub-station auxiliaries, heating and lighting, an auxiliary transformer is connected to the 35-kV system through outdoor fuses; there is also a battery.

One sub-station is manually operated, the five others having remote and local control. One of the latter is controlled from the manual sub-station by a code-selector system with two telephone pairs; the remainder are worked over multicore cable from the nearest railway station. The term "remote control" includes indication of the state of all sub-station breakers and rectifiers, lock-out conditions, meter readings and telephone.

Track sectioning cabins have been placed between adjacent sub-stations. In each of the six, the incoming lines from the catenary are connected to a common 3.3-kV bus-bar through forward-tripping high-speed breakers. Reclosing gear is automatically operated from the 3.3-kV incoming lines, obviating the need for control batteries and charging apparatus in the cabins. Main-line overhead equipment consists of two 0.155 sq. in. h.d.c. grooved contact wires (which have no mechanical splices) alternately suspended from a 19/.083 in. cadmium-copper catenary supported from a galvanised tie-bar and tie-rod cantilever fixed on insulators carried on a steel mast. The normal length of a span is 236 ft. At the end of each drum length catenary and contacts are brought to a common yoke and tensioned by cast-iron balance weights mounted on the mast; the load is transferred by a g.s. chain passing over ball-bearing pulleys. There is an anchor at the middle of the tension length (normally 3,936 ft.) and the intermediate cantilever supports swing as a gate with movements due to changes of temperature. Up and down lines are mechanically independent.

For tangent tracks the contact wire is usually staggered about 11¾ in. from the centre of the pantagraph in opposite directions at adjacent supports. In sidings and junctions a fixed catenary and single contact wire terminating in steel compression springs have been employed. In the tunnel (3,940 ft.) two contact wires (spring anchored at each end) are alternately suspended from a single catenary supported from cross spans.

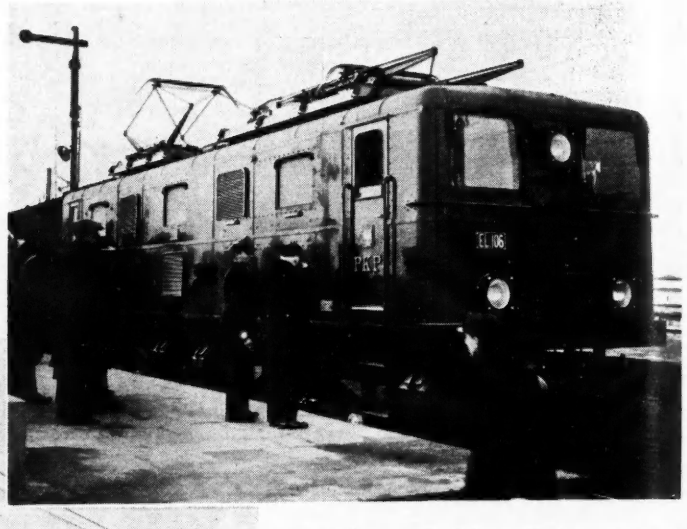
Generally the masts are formed of two No. 12 channels with riveted strip bracing, but on the Minsk section welded batten plates are used. Foundations are of concrete in which a cored hole has been left for the masts to be grouted in after erection. Foundation bolts are used as well for cross-span constructions.

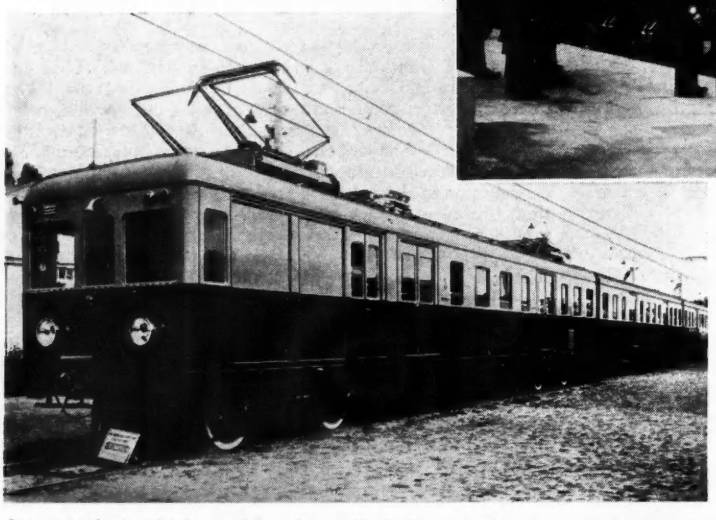
Single-disc insulators are employed for the supports and the insulation between tracks in junction work, but double insulation for terminals, switches and sections. The switches, of the knife type, are not designed for breaking under load. Connections between the sub-stations, track-sectioning cabins and the overhead line are made by p.i. l.c.a. cables, a lightning arrestor being mounted on the overhead equipment at each feeder position.

The main duty of the 78-ton locomotives is for passenger traffic, but they will also be employed in hauling freight trains through the tunnel. The body, a single structure 40 ft. long by 9 ft. 6 in. wide, divided into five compartments, is carried upon a pair of bogies, each with a wheelbase of 9 ft. 3 in. and with two driving axles. The bogies are coupled by an articulated joint which has no lateral play and allows them to swivel freely and to rise vertically to one another on curves and grades.

Each axle is driven by a series-wound interpole motor with a one-hour rating of 550 h.p. at which the tractive effort is 4,300 lb. and the speed 39¾ m.p.h. At the continuous rating of 450 h.p. the corresponding figures are 3,260 and 42¼. The wheel diameter is 48 in. and the gear ratio 22 to 69. Forced ventilation by one blower per motor pair is assisted by fans on the armatures. The motors, while insulated for the full line voltage, are permanently connected two in series.

Right: One of the locomotives. Below: One of the multiple-unit trains



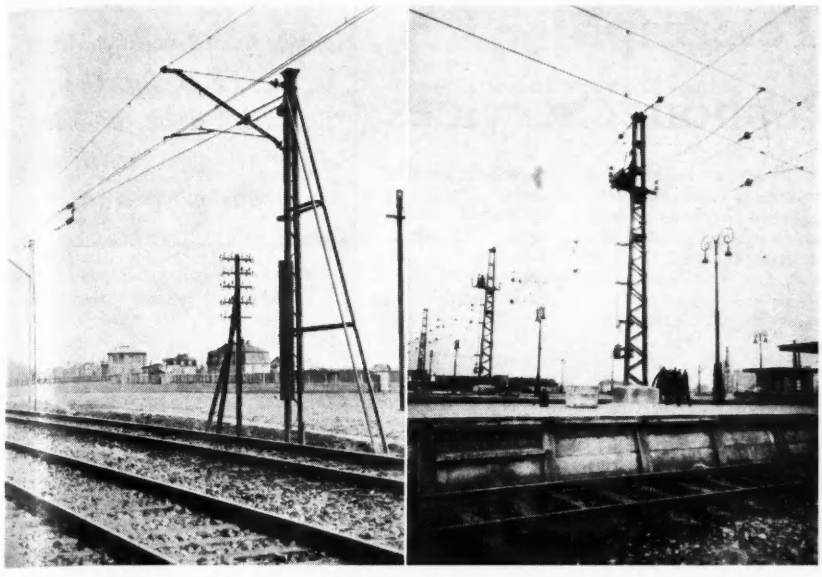


The pantagraph (two of which are fitted per locomotive) is raised by an air piston, rapidly at first but slowly near the wire, and has a single collecting pan so mounted as to remain constantly horizontal. On the roof are also isolators, fuses, lightning arrestor and choke coils

In the high-voltage compartment, which cannot be unlocked while alive, are the contactors and resistances for the control of the traction motors. The contactors are individual air-break switches with magnetic blow-outs on the Metro-Vick electro-pneumatic system in which the contacts are closed by means of compressed air pistons actuated through electrically operated air valves and opened by springs. For reversing the current in the main fields, a two-position drum switch is operated by a compressed-air engine. The master controller in the driver's cabin has two drums, one with thirty-two notches for connecting the motors two or four in series and providing three stages of field weakening and the other for reversing.

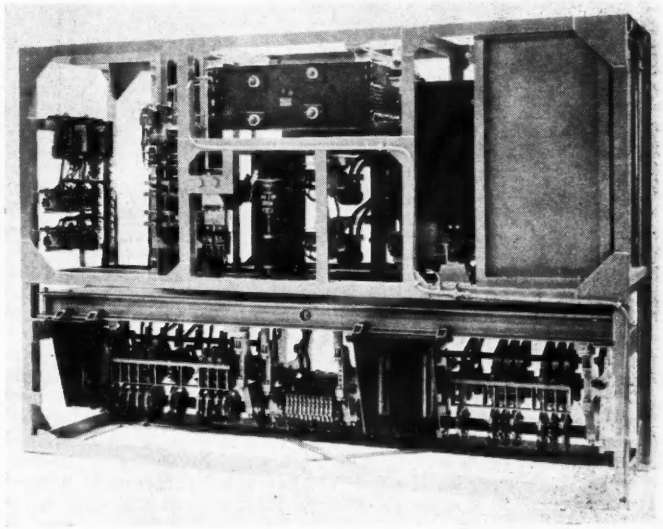
In one of the two machine compartments is a 3,000/110-V motor-generator which supplies current to control circuits, lighting and auxiliary services and the compressor motor for the brake system and for operating the electrical contactors and the blower for the ventilation of the main motors. A trickle-charged nickel-cadmium battery provides a 110-V stand-by supply. Brakes are worked by a Westinghouse automatic system with an independent air brake on the locomotive and separate cylinders on each bogie.

Double windows with air-operated wipers are fitted in front of the driver and heaters are installed in the cab. Instruments comprise a voltmeter, ammeter and a speed indicator and recorder. Lever arms are provided on the track to operate a train-stop device, cutting out the control and applying the brakes independently of the driver.



Overhead line equipment. Left: Bracket arm construction and tensioning weight. Right: Typical station construction

In regard to the multiple-unit stock for the suburban services accommodation for 272 passengers is provided in each of the train sets, which consist of a motor coach and two common-bogie trailers. Four axle-mounted self-ventilated motors are operated two in permanent series. They are series wound with two stages of weak-field control (70 and 50 per cent.). At the continuous rating of 144 h.p. the tractive effect at full field is 345 lb. and the speed 32.5 m.p.h.; at the one-hour rating of 200 h.p. the equivalent tractive effect is 565 lb. and the speed is 27.5 m.p.h. Transmission between the motors and the 39½-in. diameter wheels is through straight spur gearing with a ratio of 74 to 21.



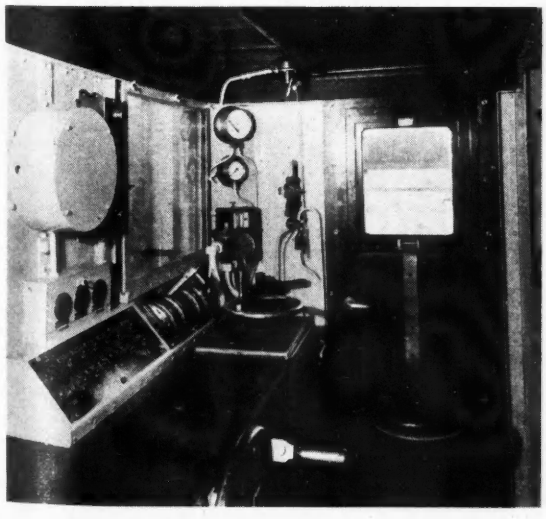
The auxiliary and high-voltage compartment of one of the motor coaches

Two pantagraphs are mounted on the motor coach; these are of the single-pan type as used on the locomotives, but a hand-operated pump is installed for raising the pantagraphs if the air reservoirs become exhausted. Current from the line passes through a cartridge fuse and choke coil which in association with a condenser-type arrestor provides protection against surges.

The control gear is mounted on two removable frames (one for high voltage and the other for auxiliary and control circuits) in separate compartments, the doors of which cannot be opened when the apparatus is alive. An English Electric motor-operated cam-shaft controller arranges the series-parallel grouping of the main motors, cutting out the resistance steps and carrying out the field-control stages; this positive mechanical sequence obviates the need for electrical interlocks. Current is interrupted only by the electro-pneumatic operated line switches, of which there are four, two for inserting a current-limiting resistance and two for breaking circuit.

Train movement is governed by a master controller with mechanical interlocks and dead man's button. Acceleration in the forward sense is either manual or automatic under the control of a current-limit relay, but in reverse it is manual only.

The control circuit is fed from a 10-kW, 3,000/110-V motor generator. The motor is controlled by a remote-operated electro-magnetic contactor and the generator output by a voltage regulator. Across the terminals of the generator floats a 73-cell nickel-iron battery, which also supplies current in emergency for lighting and for the compressor which supplies air to the Westinghouse electro-pneumatic brakes and for closing and opening the doors. Contacts on the master controller prevent the application of power to the motors until the doors have been closed and the brakes released.



Locomotive cab showing master controller and instruments

Each motor coach carries twenty-eight and each trailer thirty-two 700-W heaters mounted on the floor and connected four in series across the 3,000-V system. Two circuits, controlled by an electro-magnetic contactor, run throughout the train; one is manually and the other thermostatically operated. In the driver's compartment is a window heater as well as a cab heater.

The electrification of the railway system around Warsaw forms an important stage in the improvements projected by the Polish Government under a comprehensive policy of modernisation and unification of the three systems that were formerly entirely separate.

Radio Interference

A new form of radio interference has appeared since the grouping of high power transmitters. The *Post Office Electrical Engineers' Journal* contains details of a number of instances of spurious emissions which have resulted from external inter-modulation between transmitters in "close" geographical relationship in England, Poland (14 kilometres apart), Norway and America. The cause is so far unknown. The spurious radiation is identifiable as the sum and difference of the respective frequencies of pairs of stations. In addition to this simple combination, these frequencies in turn produce further sum and difference value by interaction with a third station. Still further terms which might be expected have not yet been observed.

Growth of Telegraph and Telephone Services

In his presidential address to the I.E.E. Sir George Lee tells what is being done to cope with the expansion in traffic

PUBLIC response to reductions of tariff rates, made possible by lowering the cost of the telephone service, has been such that the growth of the system has been phenomenal. What the Post Office is doing to meet the situation was described by Sir George Lee (engineer-in-chief, G.P.O.) in his presidential address to the INSTITUTION OF ELECTRICAL ENGINEERS in London on October 21st.

The growth induced by tariff cuts has permitted improvements to be applied immediately in new plant, without waiting for obsolescence and depreciation. Spare plant has been rapidly exhausted and the working circuuits from London to the south-west, middle north and Scotland have been tripled in number since 1934. This has led to a large increase of personnel, both in the P.O. and in manufacturers' works, and the P.O. training schemes have been considerably enlarged. The rate of increase of the workmen grades has, for some time past, been over 6,000 per annum. The number of trainees yearly passing through the central school at Dollis Hill is now 4,500, there being accommodation for 600 students at the same time. The regional schools have accommodation in all for 800 students. School training is coupled with subsequent experience in the field, and for workmen stationed too far from technical education centres correspondence courses are run from Dollis Hill; 4,000 students are taking these courses.

Large-scale Mechanisation

The method of forecasting development has been made more reliable. As capital charges, in the form of interest and depreciation, constitute such a large part of telephone costs, it is essential that this work should be done well if future costs are to be kept low. Under-forecasting is just as wasteful as over-forecasting. New methods of maintenance are tending to reduce costs and increase reliability of service.

Regarding trends of design, for the local exchange and its network, the P.O. has decided on a complete policy of mechanisation on the "Strowger" system. At the present time 50 per cent. is automatic and further transfers are proceeding rapidly. The main problems at the moment are the provision of new plant in large quantities and the improvement of maintenance and service conditions. The emphasis which is being laid on this will lead to the development of new systems in which reliability of service will be very much improved.

At present 90 per cent. of trunk circuits is underground. The amplifier, or repeater, reduced the necessity for so much loading. Now, with the arrival of the feed-back repeater, there is an economic possibility of carrier on underground circuits, and, for short distances, unloaded circuits with feed-back amplifiers. Loading is, therefore, being replaced in the newer cables by unloaded circuits. The new trend entails a large number of problems in signalling (calling, dialling, and clearing), as well as in the complexities of amplifiers and filter arrangements. On the operating side the trend is toward mechanisation, which is expected to lead to a quicker and cheaper system. In the international trunk system organisation and technical processes are proceeding steadily.

The twelve-channel high-frequency carrier system, which operates over underground cable pairs and employs a frequency range extending to 60 kc, does not represent so great a break with earlier technique as the co-axial system which uses lines of special construction and frequencies extending into the megacycle range. Prior to the changes in tariffs in 1934 the blocks of twelve potential circuits represented by each pair would have been too large on all except a few routes, but groups of this size are well adapted to present requirements of traffic on the longer routes. The adoption of the twelve-channel system as standard for new circuits between zone centres, beside materially reducing the cost of new circuits, has eased the pressure on cable manufacturers. Cables provided on a twelve-channel basis contain roughly one-sixth of the material in the equivalent audio cables operated in accordance with the earlier technique.

Reduction in expenditure on cables by twelve-channel working is accompanied by a heavy increase in equipment at the terminals, and its accommodation is proving a matter of considerable difficulty. In the twelve-channel system repeater stations are required at intervals of about 20 miles. The initial outlay on cable provision is relatively small and the cost of equipment can be incurred as and when increase in traffic requires it. The provision of a separate network linking the zone centres has enabled a standardised cable to be employed.

A further system which is under trial is that of wide frequency-band carrier on the co-axial cable on what may be regarded as the main artery of trunk telephone traffic, from London to Birmingham, Manchester, Leeds, Newcastle and, possibly at a later stage, to Edinburgh and Glasgow. Besides its use for telephony the installation of the co-axial cable was undertaken with a view to making provision for the transmission of television programmes, and it is the intention to concentrate more effort on this aspect. The popularising of television will inevitably lead to the linking together by land lines of all the main centres of the country. Sir George even suggests that distribution of television programmes by wire to subscribers may be the means of so simplifying and cheapening the cost of television broadcast reception as finally to make entertainment by television in the home as widespread as sound-broadcast reception is to-day.

A voice-frequency signalling system (using 600 and 750 cycles per sec., the receiving arrangement being tuned to respond to the comparatively pure wave-form of the signalling impulses and not to the complex wide band of frequencies present in speech transmission) is being applied to the existing manual trunk network. This will enable the controlling operator at the originating trunk exchange to dial the subscriber direct in all towns to which she has a through trunk connection, without the intervention of the operator in the distant town. Later, when the circuit provision is ready, automatic switches will enable trunk circuits to be set up in tandem and subscribers in any town dialled direct by the controlling trunk operator.

There may be 100,000 relays in an exchange of the director type, as in London, while the setting up of a single call may involve upward of 200 relays and 1,500 contact operations. Out of a total of 17 million relays there are 1.5 million Type 3,000 relays in service. This type is liable to 0.025 fault per relay per annum.

An improved selector, Type 2,000, developed by one of the manufacturers in this country, has recently been standardised for all future exchanges. There may be 8,000 in a large exchange. The reduction of maintenance cost is indicated by the fall from about 10.75 to just over seven man-hours per plant unit per annum in ten years, in spite of the growth of the more complex automatic plant.

Telegraphy

Within the past decade wholesale changes in equipment and technical practices have effected a complete metamorphosis in the operation of the telegraphs. There is a very important difference between the economics of telegraph and telephone services, in that the operating charges preponderate very considerably over all other charges in the case of telegraphs. The prime consideration in reducing the cost of service must therefore be providing the most efficient means for handling and signalling the telegrams. The policy was, therefore, to abolish from the inland service all the older systems and the whole of the heavily worked circuits have now been converted to teleprinter operation, while the very lightly loaded circuits have been converted to telephone working A more recent development has been the introduction of an "ancillary" system of teleprinter working to facilitate operating on medium-loaded circuits. The combined effect of all the steps taken has been to secure a 65 per cent. improvement in the average hourly output, compared with that obtaining before the introduction of teleprinters. In addition, the transit of telegrams inside the offices from circuit to circuit, and from circuit to output, has been speeded up by ample provision of conveyor belts.

Sweeping as the changes in instrument room practice have been, even more radical has been the reorganisation which has taken place in the line network. The multi-channel voice-frequency system enables eighteen duplex telegraph channels to be worked simultaneously on a four-wire telephone circuit. The whole of the main-line telegraph communications has now been converted, line plant to the value of some £2,000,000 having thereby been released to meet the heavy demands for telephone trunks. The economies of voice-frequency working have also enabled a more liberal provision of teleprinter circuits to be made, so permitting a further saving in operating costs by avoidance of the retransmission of telegrams at intermediate offices.

The total number of inland telegrams transmitted fell from 55.7 millions in 1922 to 35.3 millions in 1934, but when the six-

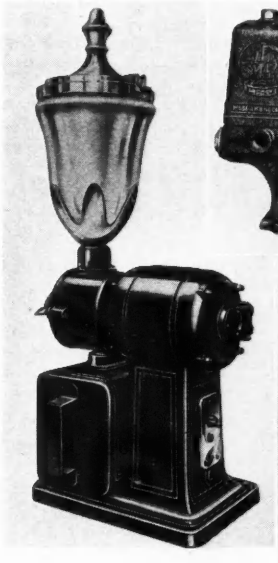
Small Motor Applications. By "Contact"

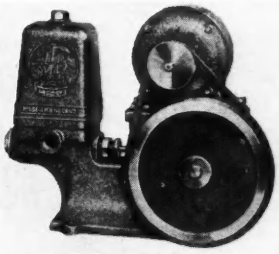
How special requirements are met

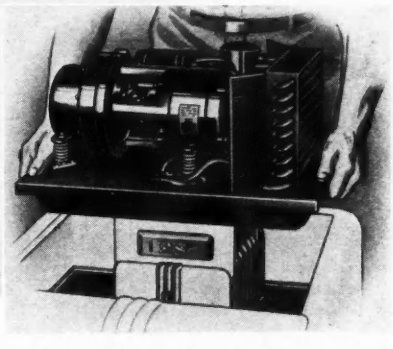
THE largest users of fractional-horse-power motors are undoubtedly refrigerator manufacturers. In selecting a motor to drive a refrigerator compressor there are two important features to be considered, reliability and quiet running. It must be remembered that once the refrigerator has been sold to the customer it has to work for many years, and in most cases without any attention except perhaps for an occasional inspection by the service engineer.

With domestic refrigerators only a single-phase or d.c. supply is usually available, so that the choice is limited to a small range of motors, namely, split-phase, repulsion-induction and capacitor motors, and on d.c. compound-wound motors suitable for direct starting. As d.c. is largely giving way to a.c. it is not proposed to deal further with it here.

The split-phase motor is probably the most reliable single-phase motor, but develops only about 175 per cent. full-load torque at starting. As this is not sufficient to start some compressors under certain conditions an unloading device is necessary, so that the full load of the compressor is not taken up by the motor until it has reached full speed and has cut out the starting winding.







Peerless coffee grinder, with ¼-h.p. split-phase motor; ¼-h.p. Met.-Vick. motor driving an "Argosy" pump; and a "Coldspot" refrigerator unit comprising a capacitor motor direct-coupled to a compressor

Until a few years ago the most popular type of motor for refrigerator drives was the repulsion-start induction-run, with brush-lifting gear, so that there was no noise from the brushes on the commutator. Even now some manufacturers still favour this type, which has an excellent starting torque, and, fitted with sleeve bearings, is reasonably quiet. With both these types of motor there is, however, a magnetic hum caused by a pulsating field, which is characteristic of single-phase motors.

In order to overcome this disadvantage the capacitor motor has been developed. This consists of an induction motor and condensers run in parallel, which gives the effect of a two-phase motor with a rotating field, and so magnetic hum is reduced to the minimum. So well are some of these motors made that it is almost impossible to hear them in operation. In addition, the motors are mounted in rubber bushes fixed round the bearings; thus, if there is any vibration it cannot be transmitted to the refrigerator cabinet.

Automatic Belt-tension Device

A recent development in f.h.p. motor design is the automatic belt-tension device. The motor is pivoted, and tightens up the belt as soon as the motor begins to pick up the load. This type of suspension is a great asset to refrigerator manufacturers, as it solves the problem of belt stretching, which is inevitable after much use. Many manufacturers couple the motor direct to the compressor, which makes a better engineering job and does away with belt noise. This, however, necessitates a spigot mounting, and unless the machining of the spigot is accurate to one ten thousandth of an inch trouble is likely to be experienced with the bearings. It is presumably for this reason that more manufacturers have not adopted this type of mounting.

The petrol-pump motor is now taking a front line in f.h.p. motor sales. It is usually a four-pole machine of about ¼-h.p., the repulsion-induction motor being used for a.c. single-phase. The motor is of the short-rated type as the duty is intermittent. It has to comply with the regulations for petrol vapour, and must therefore be of the flameproof type, requiring a certificate from the Buxton testing authorities. This is a very exacting specification, and the motors are usually designed in conjunction with the pump manufacturers, as they have to fit in the petrol pump itself. In some motors a tumbler switch is built into the frame of the motor for direct starting.

Food Machinery

F.h.p. motors are now being used in every branch of the food industry, *e.g.*, for driving cake mixers, sausage fillers, potato-peeling machines and coffee grinders. As cleanliness is essential a totally enclosed motor is called for, preferably with ball bearings, in order that there may be no possibility of oil being spilt over the machine. All such motors are direct-coupled, usually with a spigot, so that the shaft is not exposed.

The majority of these machines are sold to non-electrical people, and it is very important to supply a reliable motor which requires the minimum amount of attention. It is for this reason that the split-phase motor is so popular with the manufacturer. There are, however, certain applications requiring heavy starting torques, such as with a bacon slicing machine, for which repulsion-induction or capacitor motors are used.

Universal Motors

The universal type is the simplest of all f.h.p. motors. The vacuum cleaner is its commonest application, owing to the high speeds required, coupled with the fact that it works equally well on a.c. and d.c. Until a few years ago one of the biggest fields for this universal motor was in connection with the electric gramophone, but with the development of the disc motor it has lost favour for the purpose. The universal motor is largely used for hairdryers and for vibrators used in hairdressing, and one of the latest applications is to the electric razor. It is also used for driving small watchmakers' lathes and fretwork machines. There is even a motor-driven rubber for drawing office work. Universal motors are used extensively in small electric tools, screwdrivers, cloth-cutting machines and drills.

With the advancement of individual drives for machine tools the f.h.p. motor is being used extensively, and the combined motor suds pump is replacing the old type of belt-driven suds pump. On some modern machine tools it is common to find five small motors on one machine, such as a thread-grinding machine.

Growth of Telegraph and Telephone Services

(*Continued from previous page*)

penny telegram was introduced in July, 1935, there was an immediate increase in traffic of 34 per cent. over the corresponding period of the previous year, and for the twelve months ended March 31st last the traffic was 40 per cent. greater than for the year preceding the change in tariff.

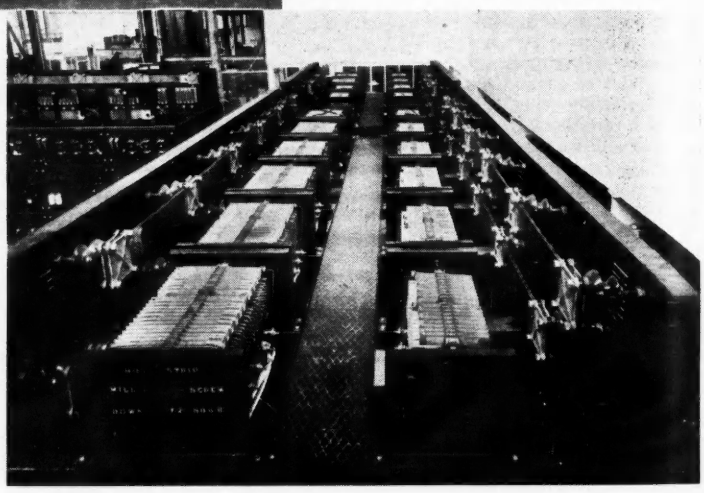
The policy of securing reductions in operating costs is still being actively pursued and, from proposals now under investigation, it seems probable that still further substantial economies may be realised. The way has been paved for the establishment of a switched telegraph system utilising the familiar methods of automatic telephony. The proposed circuit provision on main routes is designed to give a grade of service of one engaged call in 500 at times of peak season load, and the country would be covered by approximately thirty switching centres, so interconnected that alternative routes would be available for all calls. The second route would be secured by dialling an alternative number, which would appear in the directory. Experimental equipment comprising twenty-two teleprinter positions and six skeleton switching centres has been set up and subjected to engineering and traffic tests, with promising results, and from an engineering point of view there seems to be no doubt that a satisfactory system can be provided.

Steelworks Control Gear

Intricate electrical apparatus for a new South Wales works for continuous wide-strip steel rolling

WHILE it must necessarily be a considerable time before the "running-up" of the new iron and steel works at Ebbw Vale of Richard Thomas & Co., Ltd., which will represent the first installation in this country for continuous wide-strip steel rolling, it is encouraging to learn that headway is being made by the electrical manufacturers in the production of the various equipments, in spite of the present material-delivery troubles.

This week, at the Bedford works of the Igranic Electric Co., Ltd., we saw the first batch of control gear to be assembled before despatch. It is an imposing display and affords some idea of the great size of the electrical installation which will be so essentially a part of this new South Wales venture.



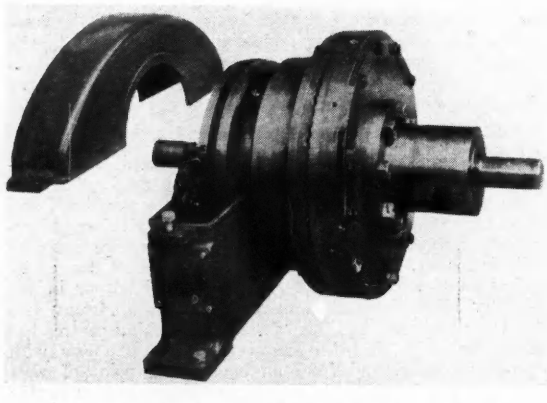
Above: No. 3 hot-strip mill control board—screw downs, tables, &c. Right: Nos. 4a and 4b finishing mill control board—resistance layout

The main line will consist of soaking pits, slabbing, roughing and finishing mills and extend to coilers, shears and a piler table for cut strips. Other hot and cold mills will give special finishes to the strip, which will also be treated by continuous electrolytic cleaning gear. It is chiefly for the extensive auxiliaries of these mills that the control gear in question is being produced, and the special controls associated with main driving for wide-strip mills will be supplied by the motor manufacturers.

The majority of the motors will operate at 230 V, d.c., and will be controlled by inductive time-limit equipment. This is largely mounted on open-type switchboards spaced back-to-back from 6 ft. to 8 ft. apart. The supporting framework between each pair of boards carries at the top a cat-walk along the centre for the whole length of board, and on either side of this cat-walk are mounted resistances, each of which is directly above its corresponding back-of-panel equipment.

Of the eleven control boards to be installed No. 1 is fitted with the equipment for the ingot bogie, front and back working tables, and the screw-downs, manipulators and run-out tables for the slabbing mill; No. 2 board accommodates controls for such furnace auxiliaries as pushers and conveyors; No. 3 board has the equipment for the conveyors, screw-downs, side-guard adjustments and the pull-backs for the roughing strip mill; No. 4 board carries the auxiliaries for the finishing stands of the hot steel mill, consisting of screw-downs, pull-backs, chute guides and loopers; No. 5 board provides for the coiling and shearing operations, with controls for coiler cams and buffers, coil upenders, pinch-rolls, the piling table, piler traverse and piler chain lifting; No. 6 board houses special apparatus supplied by one of the motor makers; Nos. 7, 8, 9 and 10 boards, which will control various skin pass mills, are composite equipments in that they also accommodate some of the main drive control gear referred to.

A separate tandem mill screw-down panel handles eight pairs of screw-downs, and where screw-downs are provided with two motors, *i.e.*, one for each screw, an Igranic electro-magnetic clutch is fitted to ensure synchronous running when required. Three master drums are provided to operate these motors, either of them independently, or both together. The gear on the above-mentioned control boards serves motors varying in size from ¾ h.p. to 150 h.p. The majority of the screw-down motors range from 7½ to 35 h.p., while the slabbing-mill screw-down is driven by two 150-h.p. motors. Motors of 100 h.p. serve the slabbing-mill tables, while some of the levellers are driven by 75-h.p. motors. The smaller tables are operated by 50-h.p. and smaller motors.



A special electro-magnetic clutch (15-in. diameter)

Many of the auxiliary drives incorporate magnetic brakes, friction clutches and serrated face clutches. An example of the last-mentioned equipment was demonstrated to us with satisfactory results. It has 84 complete serrations and one half of the clutch is of non-magnetic steel to prevent "sticking" which would result otherwise from residual magnetism.

In addition to control equipment for other sections of the works—ore-bridge, coke-oven, blast-furnace and crane drives, for instance—we also saw under construction some heavy magnets. Rectangular magnets are being supplied for handling sheets and special 55-in. diameter circular magnets for handling coils. The latter magnets are fitted with the company's pole shoes which enable the lifting magnet to be used for ordinary service with reasonable efficiency.

Fulham Maternity Home

An important electrical load

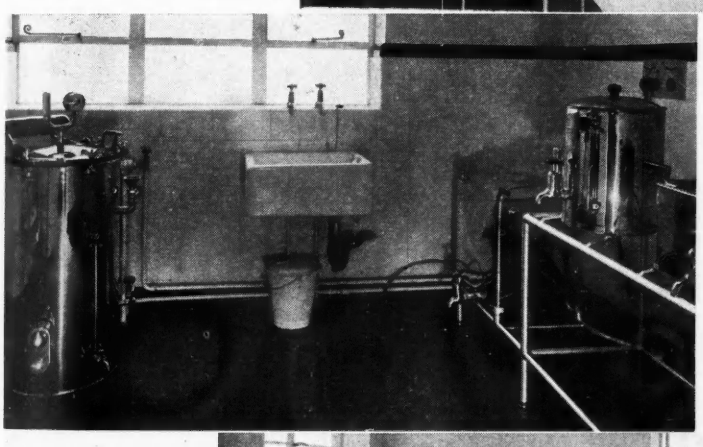
Apart from 600 kW of thermal storage plant, electricity is used in all sections of this new institution

ALREADY one child in every two born within the Metropolitan Borough of Fulham attends the Council's welfare centres. With the object of rendering this service still more generally available a new maternity home and clinic has just been completed. The concentration of both forms of service within the same building will ensure continuity of medical supervision; but, as child welfare activities are essentially educative and preventive, treatment facilities in the main have been limited to dental care and light-ray therapy; the latter is being made available to every inhabitant of the borough.

The new buildings overlooking Parsons Green are arranged in three three-storey blocks, connected at each floor level by wide corridors, with staff quarters on the topmost floor. They can appropriately be described as all-electric and are heated entirely by hospital-type "Ideal" radiators. The water circulating through them is heated by a thermal storage plant installed by James Combe & Son, Ltd., in the basement. The three electrode boilers (Mascarini patent) supplied by Bastian & Allen, Ltd., are each of 200 kW at 400 V and 50 lb. per sq. in. pressure arranged for thermostatic operation.

Wall-type radiator in nursery and bed-head lamps and plug sockets [*Elec. Rev. photo.*

Beside the automatic regulation and safety control panels there are three oil circuit breakers of 300 A three-phase each, a Measurement metering panel and Drayton regulator. Three-phase 440-V Bull motors with Allen West and Igranic push-button starters drive the Pulsometer pumps. The primary and secondary circulators (with a stand-by set) are each of 0.75 h.p. at 920 r.p.m., the two thermal-storage tanks being of 8,000 gal. each. The sump pump is of 1 h.p., 1,400 r.p.m., while the domestic hot water service pump is of 0.5 h.p. at 920 r.p.m., with two calorifiers of 1,620 gal. each.

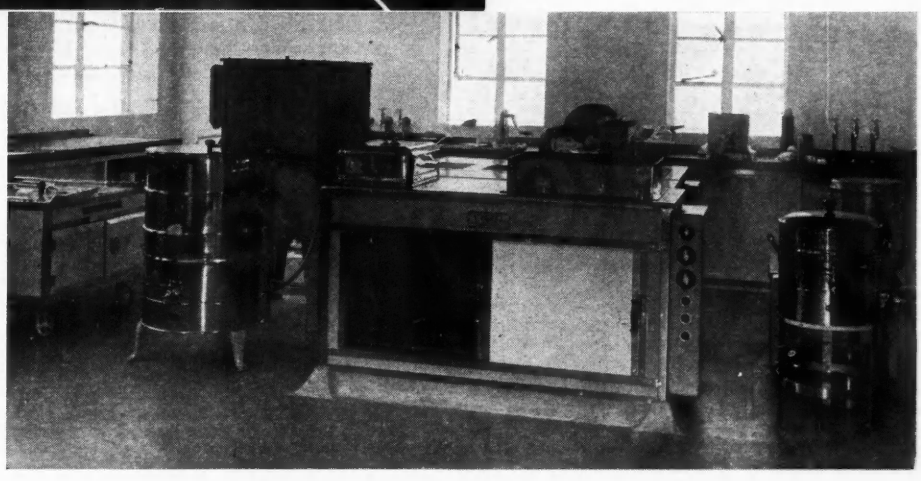


The all-electric kitchen [*Elec. Rev. photo.*

In addition to the water radiators, two-element electric fires have been built into the walls of certain staff sitting rooms and patients' wards. In the nursery a 1-kW Ferranti radiator has been fixed high on the wall with an adjustable reflector for directing the beam downward.

There are three Express lifts, all push-button operated. The speed and size of the largest enable stretcher-bed cases to be accommodated without discomfort. The other two are 2-cwt. service lifts of 1.25 h.p. into one of which can be wheeled a low-type G.E.C. trolley (preheated electrically) for conveying hot food from the main kitchen, which is on the top floor at the rear of the premises, with fume-extracting ceiling canopy.

The cooking equipment is all-electric, mostly of Jackson make, connected to two circuits protected by ironclad Crabtree switch-fuse boxes of 60 A and 30 A at 230 V. There are a double oven range with five hotplates of differing sizes on top, a double hotplate of low "stool" type, a 25-A steaming oven, a 56-A hot cupboard with carving table top, a vegetable boiler and stockpot. A 1.7-A mixing machine and a dish-washer are of Hobart make; there are also a G.E.C. drink mixer and a Bulpitt kettle. In the small ward kitchens are British National grillers incorporating



The main sterilising room [*Elec. Rev. photo.*

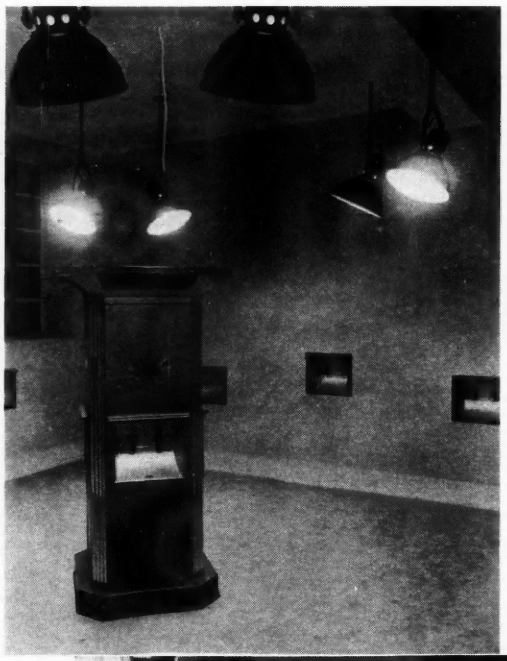
"Metrovick" boiling rings, in addition to Bulpitt kettles.

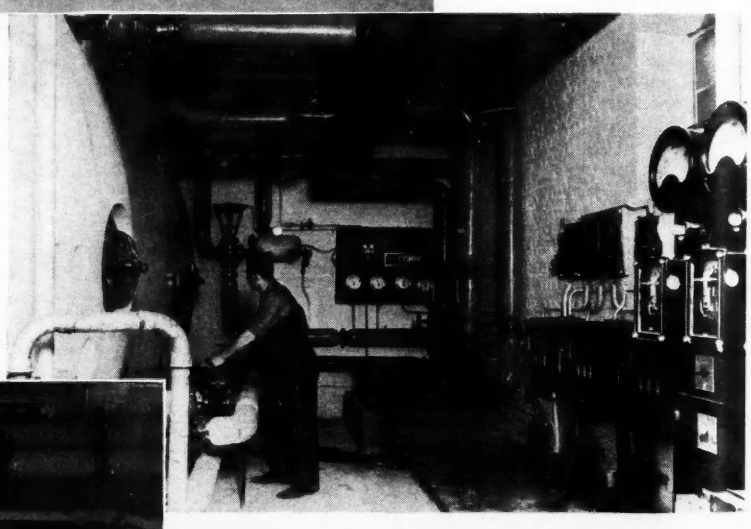
The light-ray treatment rooms have been equipped by Hanovia, Ltd. Individual cubicles are provided with Kromayer and "Duo-ray" outfits. The latter consist of a "Sollux" infra-red radiator element with a focusing hood and an "Alpine" mercury-vapour tube lamp with a movable reflector, which are adjustable separately, on two columns with a common base housing the controls for both.

The main sun-ray room is arranged as a circulatory promenade. Inset in each of the four walls at different levels are three ultra-violet discharge tubes of the quartz electronic h.p. type in parabolic reflectors, together with one in each of the four sides (facing the corners of the room) of a central pedestal; sixteen in all. Suspended from the ceiling are four pairs of adjustable radiant heat reflectors, each containing a 500-W angle-burning "Osram" bulb, gasfilled and orange tinted. A ninth is directed upward from the top of the centre pedestal, making a total of 4.5 kW—an aggregate of 25 lamps in the one room, all a.c. at 210 V.

Treatment is supervised through an observation window from an adjacent control cubicle containing two four-unit desk-type panels with pilot lamps, tumbler switches, press buttons and intensity variometers for the u.v. tubes. A group of tumbler switches inset in the wall controls the heater bulbs and an exhaust fan assists window ventilation.

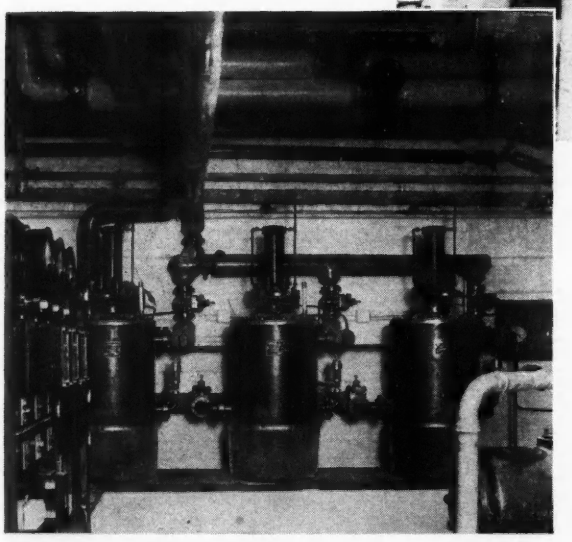
The dental surgery, with space for two outfits, at present contains one Rathbone (Dental Manufacturing Co., Ltd.) "engine" for a.c. 200-V operation, incorporating a miniature air blower, motor drill, fan, illuminated mouth mirror, spot light and four-cluster lamps, with foot pedal adjustment of the chair.





Top: Light-therapy treatment room. Right: Heating pumps and control gear. Below: Thermal storage electrode boilers *[Elec. Rev. photos.*

One of the two theatres is provided with a shadowless lamp (Scialytic patent) by Technical Lights & Equipment, Ltd., in conjunction with "Keepalite" (Chloride) emergency lighting plant. The adjacent sterilising room has been equipped by Allen & Hanbury, Ltd., the immersion type heaters being controlled by two rotary switches at the base of each vessel. The smaller sterilisers in other parts of the home were supplied by G. E. Thackery, Ltd.



For general lighting totally enclosed ceiling fittings (G.E.C. and Troughton & Young, Ltd.) have been used throughout, mostly small spheres. There is a bed-head fitting for each patient, neatly built into the wall, combining a cowl reading light and doctor's inspection lamp plug, separately switched; a jack plug terminating in a rubber bulb push button for the luminous call system, which avoids noisy bells; and wireless headphone sockets. Loud-speakers in the wards and staff rooms are served by a central radio receiver installed by the Standard Electrical Co., Ltd. The electric clocks are Smith's and the G.E.C. fire alarms with indicating lamps in the corridors are of the break-glass-push-button type. Apart from the P.O. telephones intercommunicating instruments have been installed by the British Home & Office Telephone Co., Ltd.

The electrical installation was carried out by the Fulham Electricity Department under the supervision of Mr. M. C. Parker, chief engineer, assisted by Mr. A. V. Mathias. Between the basement sub-station and the "boiler" house is the incoming switch room, containing Measurement and "Elgee" meters, with Ellison oil circuit-breakers and switch-fuse boxes of the 250-A, 100-A, 60-A "Superior" and 30-A "Apex" types. Three-pin M.K. interlocking switch-plugs have been liberally installed throughout the building.

May Acoustics, Ltd., and Thermacoust Products, Ltd., supplied materials for the sound-absorbing corridor ceilings and the sound-insulated walls of consulting rooms and wards. The largest wards contain six beds each only, and half the available accommodation is in two-bed wards.

Trailer Sub-stations

Mobile substations mounted on railway trucks are used on the Continent. Now the Connecticut Light & Power Co. has put in service three transformer sub-stations mounted on two-wheel pneumatic-tyred trailers designed to be hauled by a motor tractor. The capacities are 200, 500 and 1,000 kVA, the maximum height being about 10 ft. 10 in. Upon arrival the sub-station can be connected as a "plug-in" unit, with the rear wheels blocked and the end of the trailer supported by drop legs, so that the tractor can be drawn away for other service.

An Electric Bicycle

It is reported that the Philips Co., of Eindhoven, Holland, has recently patented a new design of electrically propelled bicycle, the production of which is to be taken up by five Dutch cycle manufacturing concerns. It is stated that the machine is driven by a small electric motor energised by a six-cell, 12-V battery of a capacity enabling a distance, on level roads, of 50 miles to be run at a speed of nearly 12½ m.p.h. The whole of the electrical equipment weighs 66 lb.

Oil Circuit-breakers. By R. T. Lythall

A critical review of B.S.S. 116/1937

THE 1929 issue of B.S.S. 116 ran to 38 pages. The 1937 issue now released is in two parts with a total of 172 pages between them. A reading of the new specification will indicate the necessity for the great increase in size, *i.e.*, the greater knowledge of the art as compared with 1929. Even now some things are not yet sufficiently defined to allow of their inclusion.

In the main, this review will be confined to those parts of the specification dealing with the rating of circuit-breakers. This subject is by far the most important and is responsible for the increase in size and the necessity for the two parts. Before dealing with this aspect, however, brief reference may usefully be made to one or two changes made elsewhere.

A change has been made in definition which is of consider able importance. Clause 26 (1929) defined the rating of a switch or circuit-breaker as "the nominal value assigned by the maker to its performance." The new issue (Clause 32) states that the rating "is the set of values assigned by the maker to define the working conditions for which it is built." There is a critical difference here in that the new clause omits the word "performance" and merely states that the breaker is "built" to deal with certain conditions. Performance is removed to an additional clause (33) and depends on *actual* (not assigned) values obtained during tests.

In addition, several changes are made in those clauses dealing with breaking and making capacities, while additional clauses have been added to define breaking and making *currents* with sub-division for symmetrical and asymmetrical values. These additions are important in relation to the sections of the new issue dealing with this subject in view of its extended provisions, as will be shown later.

Table 4, headed "Standard Three-Phase Oil Circuit-Breakers," has been extended and revised and now shows clearly the MVA ratings regarded as standard at various service voltages and the range of normal current ratings for the appropriate breaking capacity.

Here, again, two valuable additions have been made, and in a study of this table, reference should be made to Appendix L and the schedules given therein which show the maximum permissible short-circuit currents for standard service voltages and minimum service voltages at the standard breaking capacities. These, as the appendix elaborates, are based on a breaking current not exceeding 44,000 r.m.s. amperes symmetrical, corresponding to 110,000 peak amperes making-current. For example, the maximum breaking capacity for a breaker with a voltage rating of 3.3 kV is given as 250 MVA. In other words, it is an appreciation of the impossibility of, say, 750 MVA at 3.3 kV; elsewhere the specification clearly states that networks should be designed having in mind the normal currents under load conditions and short-circuit currents under short-circuit conditions.

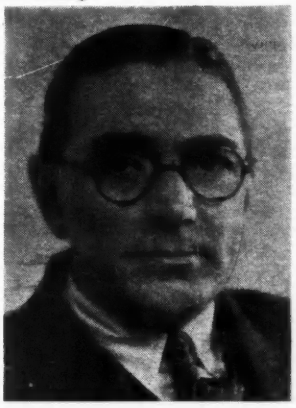
The addition of minimum normal current rating draws attention to the fact that to withstand the thermal effects due to carrying short circuit current there is a lower limit to the normal rating; *e.g.*, 750 MVA at 11 kV has a minimum normal current rating of the breaker of 800 A.

Clause 63, dealing with series trip coils, current transformers, &c., now includes a paragraph noting the relation of current-transformer short-circuit current rating to that of associated circuit-breakers. The clause dealing with limits of temperature rise now includes three allowable temperature rises instead of two and, at the same time, allows a greater rise for breakers above 200 A. Similarly, a considerable extension has been made with regard to coils and the varied types available are dealt with very comprehensively (Table 5).

Operating Mechanism

Clause 74 in Part 1 makes the important recommendation that, for circuit-breakers of which the rated symmetrical breaking capacity exceeds 10,000 A or the three-phase breaking capacity exceeds 150 MVA, some form of power operation from a distance is desirable. This recommendation follows closely upon the experience of the difficulties attendant upon closing a breaker on to a short circuit by hand, an experience unfortunately accompanied in some cases by fatal accident due to breaker destruction following hesitant operation that resulted in sustained arcing. This aspect is stressed in recent reports in *Electrical Accidents*, the publication of the Factories Department of the Home Office.

Difference of opinion will undoubtedly arise as to the limits suggested by the specification. Many will consider the values low in view of the satisfactory operation by hand of breakers much larger. It must be borne in mind, however, that in all cases the human element is all-important. The closing of a breaker on to a "short" by one operator may be carried through cleanly, while another may, on feeling the forces against him, withdraw slightly to "have another go." The intention of the recommendation is clearly to take the final control out of the hands of the operator.



Mr. Lythall is assistant manager of the Switchgear and Transformer Department of Johnson & Phillips, Ltd., and a member of the B.E.A.M.A. Switchgear Technical Committee

The importance of the additions that deal with tests, and in particular to those tests upon which the rating of the breaker will be proved, has been appreciated by many for some time and, in fact, a knowledge of the proposed recommendations has prompted some to specify them in advance of the issue.

No review of this specification would be complete without a brief reference to the knowledge now available to designers as compared with that in 1929. At that time systematic research into the phenomena of circuit interruption under fault conditions was limited. The elaborate and very complete testing stations of to-day did not exist; manufacturers had to depend mainly on experience of performance in service, such information as was then available from early tests on power systems and the work of the E.R.A. To-day the industry has the benefit of stations specially designed for short-circuit testing, the continued research of the E.R.A., and, what is equally important, the work of the I.E.C. in the preparation of an international specification (No. 56, now issued). B.S.S. 116-1937 has, indeed, been delayed in its issue in order that its provisions might link up with those of the international specification.

Even so, the foreword to the new specification (and similarly the preface to the I.E.C. Specification) frankly admits that all the conditions cannot yet be laid down with certainty and that further research is essential.

The term "kVA breaking capacity," so long in common use, does not appear in the specification. Instead the term "MVA breaking capacity" is substituted. Even so, this is only given as a convenient method of specifying standard ratings. The specification is based on the use of values of short-circuit current (making-current at specified service voltages, breaking-current at specified recovery voltage, and short-time current during a specified time) to express the rating of a breaker.

Such values of current are, indeed, to be given in reports and certificates of tests and on nameplates. Bearing in mind the practical limits of 44,000 A breaking current and 110,000 A making current, referred to earlier, this method has much to commend it and will lead to a better appreciation of the duty imposed on a breaker. It may be added here that the foregoing limits are based on the understanding that 110,000 A is the highest value of peak short-circuit current on to which a breaker can be closed. The figure of 44,000 A is, of course, derived from this.

The 1929 specification, for reasons referred to earlier, indicated only certain simple tests which, in the absence of facilities, could hardly be carried out. These tests covered only a duty cycle at 100 per cent. rating, included only one "make" shot, and made no provision for the different conditions of symmetry and asymmetry. The new specification includes all this and more. In the first place, a series of tests at 10, 30, 60 and 100 per cent. of rating is called for under conditions of symmetry—the value of the d.c. component as percentage of the a.c. component is specified—and while the three lower values include only three "break" shots each, the 100 per cent. duty cycle includes three "break" shots and two "make" shots, the cycle being defined as "B-MB-MB."

Following these duty cycles, a further 100 per cent. breaking test has to be made but under conditions of asymmetry, the d.c. component again being specified. The need for tests at the 10, 30 and 60 per cent. ratings has been proved by the fact that many breakers which have satisfactorily cleared faults equal to the 100 per cent. rating have, for a variety of reasons, failed when interrupting lower values. The test which demands two reclosures on to the short circuit makes the specification very severe, but experience has shown that this

condition is likely to arise in service and therefore must be proved.

The criteria of severity under which type tests are made are now included although nothing is yet included by way of specifying standard rates of rise of recovery voltage. The introduction of prescribed values of recovery voltage, d.c. component and power factor is all important as covering conditions likely to arise in service.

In the matter of recovery voltage, a difference occurs between Parts 1 and 2. Part 1, which covers breakers up to and including 500 MVA, specifies a recovery voltage of 95 per cent. of rated voltage. Part 2, covering breakers of 750 MVA and upwards, allows for a variation in the percentage of recovery voltage in accordance with curves produced in fig. 8, which show decreasing values for 750, 1,000 and 1,500 MVA. Such lower values are expected under service conditions to a degree depending on rating. Similarly, Part 2 allows for a modification of d.c. component values to assist testing authorities in the testing of larger breakers. This modification is, however, linked to the values of active recovery voltage accredited to a test. Factors for correction in this direction are given in fig. 10.

As to power factor, the limit under Part 1 is 0.15 lagging, and in Part 2 0.3 lagging, so that the most severe conditions have been taken care of, conditions which may rarely arise in service. Low p.f. and low value of d.c. component ensure a high recovery voltage value. It will be appreciated that if p.f.=0, then the voltage at current zero is a maximum. At the power factors specified, recovery voltages above those given in the specification are usually obtained on test. As to d.c. component, displacement of the current wave modifies the time intervals between zeros and thus has a bearing on recovery voltage.

On the other hand, the distress caused to a breaker must be related to the total (asymmetrical) value of current, and thus a test in which a high value of d.c. component is obtained is included to prove the breaker under conditions which might arise in practice—conditions which are extremely severe.

Valuable additions have been made in the new issue under the heading of "Behaviour." Obviously a condition may arise where a fault may be cleared by a breaker but in doing so the breaker becomes a wreck. The conditions under which a breaker may be said to have behaved satisfactorily are now laid down by the addition of statements concerning oil throwing, emission of flame, &c., and it is provided that reference to this behaviour shall be included in the report of test. A typical example of the latter is given.

The vital necessity for maintenance of switchgear has been repeatedly stressed. The Specification of 1929 contained clauses making certain recommendations which are included in the new issue with valuable additions, which, if acted upon, cannot be other than beneficial to the user.

It is natural that a specification which gives so much space to the requirements of testing, should also include recommendations on the selection of suitable breakers and the method of calculating short-circuit currents. These have been covered in appendices and form two of the most valuable contributions. Both have been set out very fully and clearly and both deserve the prominence given to them. It is significant that the method of selection of a breaker which takes into account decrement is not recommended. Present system conditions do not warrant selection by this method, except in isolated cases.

An appendix is devoted to the technical information which may be required by a purchaser. This in itself is not of great importance and would not be referred to here if it were not for the addition of the note which states that "the mere magnitude of many of the figures is no criterion of superiority." The significance of this lies in the fact that no longer is it to be regarded as proof that one breaker is better than another because it has one gallon more of oil or that its speed of break is slightly greater.

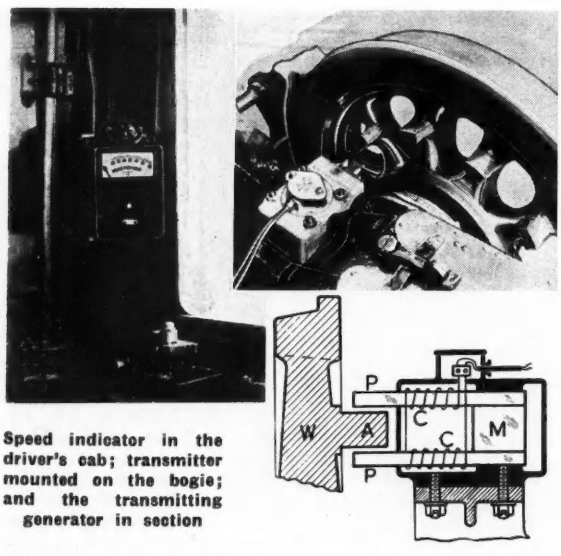
A series of valuable diagrams, curves, &c., is included. These include representations of a typical oscillogram giving a clear indication as to how it should be read, curves showing the determination of breaking and making currents and of recovery voltage, and many others. These provide information not previously available in general and accordingly form a most useful addition.

The new issue represents the combined contribution of many specialists, supply undertakings, institutions, the E.R.A. and others, and is made the more important by reason of its link with the International Specification. On its own admission, it is as yet incomplete but the work of those responsible will still go on and additions will be made in due course. This specification should not be obtained merely for the sake of keeping the file of B.S.S. complete. It should be read and read again, as a contribution towards the solution of circuit-breaker problems which concern not only the manufacturer but the user.

Finally, as set out in the foreword, some time must elapse before all circuit-breakers can comply with the requirements of a specification so radical in its changes. The facilities even to-day for testing, excellent as they are, are insufficient to cope immediately with any greatly increased volume of testing and, therefore, there must be a policy of mutual agreement concerning the application for some considerable time.

Inductor Speedometers for London Tubes

WHEN the London Passenger Transport Board decided to equip the driving positions on all new rolling stock with speed indicators no existing form of the instrument seemed suitable. A mechanical speed indicator was ruled out owing to the difficulty of providing a satisfactory drive from the middle of the axle, lack of space precluded the driving of the transmitting generator from the motor shaft, while the design of the axle-boxes prevented the use of the end of the axle.



Speed indicator in the driver's cab; transmitter mounted on the bogie; and the transmitting generator in section

Everett Edgcumbe & Co., Ltd., accordingly designed a frequency method of speed measurement, which has advantages over the ordinary voltage method in that it is largely independent of such variables as the position of the rotating armatures and the state of the generator magnets, and relies upon the number of times per minute that an armature passes between the poles.

The accompanying diagram shows the transmitting generator in section. The permanent magnet, M, of nickel-aluminium alloy, sends a magnetic flux through the coils CC, the pole-pieces PP and the armature A, one being cast on to each spoke of the train wheel W. As each armature passes between the poles the reluctance of the air gap is reduced so that the magnetic flux is increased. A voltage is induced in the coils, CC, the frequency of which is directly proportional to the speed of the wheel. There are eight or ten spokes and the same number of armatures, and in either case at 60 m.p.h. an armature passes through the poles 80 or 90 times per sec. so that for a range of from 20 to 80 m.p.h. the frequency varies from about 30 to 120 cycles per sec., the terminal voltage also increasing with the speed.

The indicator is of the rectifier-operating moving-coil pattern, is dead-beat, has an evenly divided scale, and is almost immune from disturbance by the stray magnetic fields due to nearby cables carrying heavy currents. In the upper part of the case a domed cap gives access to an internal lamp that illuminates the scale without causing glare.

In order that the equipment may be available for either 31 in. or 36 in. diameter car wheels a change-over link automatically varies the sensitivity of the indicator in the ratio of 31/36. A rheostat changes the sensitivity of the instrument and a scale marked off in wheel diameters allows of presetting to compensate for any degree of wheel wear.

The transmitter is contained in an aluminium housing with watertight terminal box mounted on the bogie, and is connected to the indicator by a pair of armoured leads of negligible resistance. All transmitters and indicators are interchangeable, both mechanically and electrically.

Some 120 of these equipments have been or are in course of being supplied by Everett Edgcumbe & Co., and further developments are in hand as the result of collaboration with Evershed & Vignoles, Ltd.

Notes From Canada

From our Dominion Correspondent

WHEN a generating station and the necessary transforming stations and transmission lines have been built and completed then comes a period of load building which, in turn, is succeeded by the provision of additional generating and transmission capacity. This procedure represents a cycle which is in constant operation the world over.

During the depression, the generating capacity available in Ontario and in many other places, far exceeded the demands made upon it—instead of loads building up they fell off very seriously. Now that business is improving the loads are steadily increasing and if this condition continues for another two or three years the stage where additional capacity is needed will be reached. Already in several places in Canada work has actually been begun on large-scale, and some smaller, hydro-electric developments and in other cases plans are either actively in preparation, or contemplated, for similar action.

Steadily increasing loads indicate an early revival of generating plant orders. Canadian producers of smaller electrical equipment are busy

At the present time electrical manufacturers in Canada are busy chiefly on the smaller electrical equipment—motors, appliances, &c., and the switchboards, instruments, poles and crossarms, wire and cable, small transformers, &c., which are required to fill domestic, commercial and industrial needs. The larger manufacturers are now looking forward to the time when they expect to be working on estimates, plans and actual orders for large turbines, generators, transformers, transmission-line towers, switching equipment, &c., for the development of the country's water power resources on a large scale.

According to *Electrical News and Engineering*, the installation of the twelfth 45,000-h.p. generating set in the plant of the Saguenay Power Co., Isle Maligne, Quebec, is nearly, if not quite, completed. It is stated that the purpose of this generator, is not, however, to increase the available amount of continuous power, but to control system frequency.

The Shawinigan Water and Power Co., through its subsidiary the St. Maurice Power Corporation, will start work during the coming winter on a hydro-electric development on the Upper St. Maurice River, having an initial capacity of 160,000 h.p. and costing about $15,000,000; the ultimate capacity will be 240,000 h.p. This company is also constructing a large h.v. distribution station to cost about $750,000.

At the Ruskin power development of the British Columbia Electric Railway Co., a second 47,000-h.p. generating unit is being installed. The first set was installed in 1930; ultimately there will be four sets, giving a total capacity of 188,000 h.p. This Ruskin plant utilises the water of Allouette Lake for the third time and that of the Stave River for the second time; it is the last of a chain of three hydro-electric stations.

A member of the Ontario Government not long ago announced that a 10,000-h.p. development at the mouth of the Montreal River would be undertaken immediately, under a Government arrangement with the Great Lakes Power Company, which recently completed a 10,000-h.p. development on the same river.

The Consolidated Mining and Smelting Co. of Trail, British Columbia, announced a short time ago in its annual report that the West Kootenay Power and Light Co. intends to build a $4,000,000 development on the Kootenay River. British financial interests are said to be prepared to investigate a proposal to erect a large dam and power house on the Peace River in British Columbia to supply cheap power, mainly for certain large industries actual and prospective.

The Ontario Paper Company has for some time been engaged in a large scheme of expansion involving the building of a huge newsprint mill and the construction of a large hydro-electric power plant. The first 35,000-h.p. unit must by now be almost, if not quite, complete, and a second one of the same size will be ready in about a month. This is on the Outardes River, which runs into the St. Lawrence River from the north at a point about 200 miles east of the city of Quebec. The water will reach the power house through a wooden pipe-line about 16 miles long and 18 ft. in diameter—this is believed to be the longest and largest wooden pipe-line in the world.

In Ontario the Abitibi Power and Paper Co. is proposing to spend about $3,000,000 in the Port Arthur and Fort William district, *i.e.*, at the western end of Lake Superior. Most of the money will be spent on changes and extensions to paper mills, but some of it will go for electrical equipment. A sum of between $5,000,000 and $8,000,000 is to be spent on a new 200-ton sulphite pulp mill in the same region, some of this also is sure to be spent on electrical equipment if the scheme goes through.

From Prince Rupert, British Columbia, comes a statement that it is expected that this autumn will see the start of a pulp mill there to cost $8,000,000. Power will be supplied by the Northern B.C. Power Co., augmented by any power that the pulp company may itself produce.

The Ontario Government has made arrangements for the cutting of pulp wood by certain United States interests and is arranging for the construction of a waterway from Long Lac to Lake Superior, whereby 4,000,000 cords of pulpwood can be floated from the former lake to the latter. The diversion of water thus brought about will add 1,250 cubic feet per second to the St. Lawrence watershed flow; this water will be available for increased power supply at various points along the Great Lakes-St. Lawrence drainage system to as far down as the Beauharnois development, not far from Montreal.

Although the Ontario Government is averse to the development at the present time of power on the St. Lawrence River, it is not long since the New York State Power Authority in its annual report recommended that the St. Lawrence seaway and power development should be undertaken without delay to ensure ample cheap power for the future, adding that in another ten years the State would be faced with a serious power shortage unless this was done; failure to do this would mean that steam plants would have to be established, placing a burden of $27,000,000 a year extra on consumers.

"Mr. Therm" reads the "Review"

Many readers, particularly those in the Provinces, may not have seen an advertisement of the Gas Light & Coke Co. which appeared in the London evening Press last week. As we think that they should see it, we reproduce the material part herewith. The quotation from our issue of September 10th (not 30th as stated) is "selective," and so we will fill in the gap presented by the dots. After the words "excellent results," we said—

"in many cases comparable with those of the electric schemes. This impression may have been received as the result of activities of men who appeared to be the maintenance staff, or of a concentration of gas lighting at such vantage points as the conference headquarters. Electrical men seemed to be pleased at the efforts of the competing industry, saying that the greater the light intensity given by the gas people, the easier it is for the electrical people to make a good case on the score of economics. We find no fault with this attitude in itself, but we hope that electrical men will not be tempted to sit on the fence of content"

'Kind words from a competitor'
says Mr. Therm
THE ELECTRICAL REVIEW
Reprinted from the Electrical Review of Sept. 30th, 1937
PUBLIC LIGHTING COMPETITION
'When we visited Folkestone this week to see the special public lighting installation we felt that a tremendous effort must have been made by the gas industry to produce such excellent results . . . . we hope that electrical men will not be tempted to sit on the fence of content.'

My friend, Mr. I'm Electric, is perfectly right.' says Mr. Therm. 'The Gas Industry *has* made tremendc orts—and is continuously making them. One re·

Electricity Supply Salesmanship

An E.P.E.A. Discussion

Many power engineers must nowadays be salesmen or have the control of salesmen; hence their interest in the subject

AT a meeting of the London Technical Group of the Electrical Power Engineers' Association on October 19th (Mr. G. M. Sichell, B.Sc., in the chair), Mr. E. G. Plucknett (sales manager, Electricity Supply Division, International Refrigerator Co., Ltd.) presented a paper on "The Electricity Supply Sales Department—Some Criticisms and Suggestions." Inasmuch as he emphasised the necessity for some technical knowledge as part of the equipment of the salesman, Mr. Plucknett mentioned his own experience on the technical or engineering side before joining the sales side of the industry.

He said that enthusiasm was the keynote of success in any sales department. In no other sphere was there such a vast difference between just doing a job and doing it very well indeed. In the former case a "prospect" might feel a little hurt at being induced to spend more money than originally intended, whereas if the salesman had done his job properly, the prospect would feel gratified by the knowledge that the electrical service could do so much at so little cost.

Emphasising the importance of clinching a sale at the proper moment, Mr. Plucknett said that a customer must not be pressed too hard; but there were occasions when, after a customer had been almost converted, there was a lull in the conversation and the salesman would merely suggest that perhaps the customer would let him know the decision in due course. The good salesman should be able to appreciate the customer's point of view, should always give accurate and reliable information, and improve the relationship between consumer and department.

Sometimes "high-pressure" selling was a good thing; but he strongly deprecated its use by supply undertakings. The consumer should be made to feel that the salesman was primarily concerned in solving his problem to his permanent satisfaction.

The acquisition of salesmanship was a matter of training and re-training. It was necessary to have contact with men and women and to study them, and an aspiring salesman should take every opportunity to practise selling both in the showroom and among his friends; he should study his own reactions to selling when he himself was a customer; he should study his products and their applications and the problems of the customers; he must possess inexhaustible patience, tact and diplomacy and must be cheerful. Personal experience was essential; after a man had installed electrical apparatus in his house his results were doubled.

Monthly meetings of sales staffs, if properly organised, could be extremely useful for re-training and increasing enthusiasm. The younger salesmen particularly should be encouraged to discuss their difficulties and the most effective methods of overcoming them. Interchange with the staffs of other departments was valuable, and visits to the works of apparatus manufacturers were also of the greatest help.

A "Point" System

Mr. Plucknett urged that the present methods of remuneration should be thoroughly revised. As to commission or bonus payments as an incentive to effort, he said that possibly there was no greater incentive than personal gain. The remuneration of sales staffs was a specialised problem, but he mentioned the "point" system of remuneration that he had advocated in the ELECTRICAL REVIEW some years ago which overcame the objection that commission payments might result in a tendency on the part of the sales staffs to push primarily the apparatus which produced the greatest money turnover. Under the point system, points were allocated to different articles according to their relative importance to the supply authority. Each salesman was expected to attain a certain quota each week, and was paid a commission or bonus on points in excess of that quota. If a special campaign were run to sell a particular article, a larger number of points could be allocated to that article for the period of the campaign. Competition between salesmen should be encouraged, and the point system offered a means of encouragement. The variation in the characteristics of different parts of an area from the point of view of selling possibilities could also be taken into account to prevent unfairness.

Other matters discussed by Mr. Plucknett were the necessity for avoiding intricate forms as far as possible, as such forms frightened many prospective consumers; the importance of co-ordination between the various departments of an undertaking, so that the efforts of the sales department should not be nullified by bad installation, or by failure to install apparatus promptly; and the value of encouraging consumers to pay their accounts at the showrooms, where they could see the apparatus available. He mentioned a case in which consumers had to pay their accounts at a gas showroom.

Members' Views

Opening the ensuing discussion the chairman said he was in favour of bonus systems, but suggested that it would be difficult to apply the point system fairly in an undertaking in which each salesman devoted his efforts to the selling of only one apparatus or type of apparatus, and not the whole range. Mr. Plucknett replied that the system was very elastic, and that points were allocated to the different apparatus according to the possibilities of their sale.

Mr. E. W. Garlick suggested that the sales staffs of electricity supply undertakings were too small; he emphasised the importance of visiting consumers after new apparatus was installed and of ensuring that it was operating satisfactorily, which would mean increased staffs. He would like to see consumers' deposits eliminated. A speaker said that members of electricity committees hesitated to spend sufficient money on advertising, etc., and he appealed to the chiefs of supply undertakings to try to educate their committees to modern methods of selling. He also urged whole-hearted support of E.D.A. activities.

Mr. R. D. La Combe stressed the importance of standardisation of tariffs; he also asked for Mr. Plucknett's views concerning the employment of women for sales work. Mr. Plucknett replied that probably female demonstrators were preferable for demonstrating cookers. The age of demonstrators who had to deal with elderly women should be taken into account, because an experienced housewife might prove difficult for a young girl demonstrator. For showroom selling generally, however, he believed that customers were more likely to be impressed by a man than by a woman.

Mr. W. J. Oswald emphasised that the really important matter was the actual cost of running apparatus rather than the tariffs themselves. The practice of his own undertaking, when a consumer asked to go over to the two-part tariff, was to show the costs for the last four quarters on the flat rate and the costs of the same service on the two-part tariff. If the figures indicated that the two-part tariff would cost him more, it was suggested that he did not make sufficient use of electricity. A salesman needed experience and personality; difficulties might arise if meter readers, for instance, were to try to explain to consumers the benefits of electrical apparatus. Mr. Plucknett said he did not suggest that meter readers should ask every consumer to buy an electric kettle or other apparatus, but they should have some training to be able to answer consumers' questions.

Mr. R. Warnes said that in his experience, where fixed salaries were paid the feeling among the sales staff was better. Mr. Plucknett said that commission should be paid to the inside, as well as the outside staffs. He mentioned a case in which, during the nine months following the introduction of such a scheme, the average increase of turnover by each salesman was 50 per cent., and the average increase of remuneration was 32 per cent.

Mr. C. M. Jockel said that district showrooms were of the greatest value. He also mentioned the E.P.E.A. sales courses and said that the Association was prepared to help salesmen in every possible way. Mr. J. R. Kinnersley pleaded for unification of sales methods in the different undertakings, and suggested that the matter might well be investigated by the Association.

Russian Power Plant Criticised

The official organ of the Russian Commissariat for Heavy Industry states that the electrical equipment of Russian power plants is noticeably less efficient than that of English and American plants. While admitting that the production has quadrupled in the past ten years it complains that too many hands are still required. In the Soviet plants fourteen persons are employed per 1,000 kVA of plant capacity, while in the U.S.A. the figure is six and in Great Britain seven.

Meetings and Discussions

The value of lighting is its ability to aid vision; therefore, said Dr. C. C. Paterson, in his Guthrie Lecture, light measurement should be in terms of colour contrast and brightness. A variety of matters were dealt with by Capt. H. Hooper in his address as chairman of the South Midland Centre of the I.E.E. when he revived the suggestion that electricity, like water, should be a "rate charge" commodity. The possibilities of air conditioning as an electrical load were stressed by Capt. J. C. Chaytor in a paper read at a meeting of the Birmingham Electric Club.

Lighting and Vision

THIS year's Guthrie Lecture of the Physical Society was delivered in London on October 22nd by Dr. C. C. Paterson (G.E.C. research director) whose theme was that in the appraisement of lighting, advance was essential from the old methods of specifying light sources, first by their physical dimensions and number, later by their intensity and more recently by the illumination produced. Lighting should be appraised in terms of its ability to aid vision, which itself depended upon contrasts.

The most easily measured characteristic of a light source was luminous intensity, but a measure which was of more value in estimating the aid to seeing was that of luminous flux. Coloured light sources added difficulties to such measurements. The adoption of an internationally accepted relative luminosity curve for the average human eye had brought the measurement of intensity of illumination to a high state of accuracy for sources with continuous spectra. The use of the photocell had added to speed and repetitive accuracy, but not to absolute accuracy.

The measuring of light sources giving a few lines only of the spectrum offered a very much harder problem which had been met by the use of sub-standard lamps and carefully selected and calibrated filters. However, with different colours errors crept in. Intensity measurements in relation to visibility would always be needed in estimating glare, a factor which had more influence on the real value of lighting than was usually recognised.

Seeing was, however, fundamentally a matter of contrasts in colour and in brightness, and it was those factors which should be measured. There were several methods of measuring brightness. Photography had been used for registering the effects of lighting on the human eye and permanently recording them on photographic plates whose characteristics with regard to light were in some ways similar to those of the eye. When the brightness of two contrasting surfaces had been measured there still were no accepted methods of expressing them in terms of their aid to vision. Frichner's fraction, which was an approach in this direction, dealt only with threshold values, and practical interest lay in values far above those. The new technique of television offered an opportunity of controlling contrast. Details of the original picture and the reproduced picture at one stage were both held in terms of electrical energy and could be manipulated

With coloured light the problem was not merely to measure colour, but to measure and specify colour and colour rendering properties. The colour of light could readily be specified on the I.C.I. trichromatic system and a rapid technique for indicating the colour of a light source directly on this system had recently been evolved. No standard had yet, however, been set up for the colour rendering properties of light. This was a problem which must increasingly engage attention It was often, for instance, through the increase in contrast that vapour lamps found their success in industrial applications, particularly where sorting operations were carried out.

Improvements and Prospects

THE inaugural address of Capt. H. Hooper, chairman of the South Midland Centre of the Institution of Electrical Engineers, at Birmingham on October 20th, commenced with an outline of the educational facilities made available in the past ten years, stressing the business and economic aspects.

Turning to domestic water heating, Mr. Hooper pointed out that, though immersion heaters had to have a higher loading for the same service than would be suitable for storage heaters, the former were not actually the "peak load builders" they at first appeared to be. The diversity was extremely high, and as the capital cost of installing immersion heaters was considerably lower than that of installing storage heaters, there was a tendency to foster the development of immersion heaters.

The result was that in the five years under review the storage heater had to some extent lost ground. To-day, for instance, the greater portion of storage heater business was done in units of small capacity, chiefly 1½ gallon, for kitchen sinks, &c., while the heating of water for baths, &c., was done by immersion heaters. To some extent development had been influenced also by the fact that modern houses did not provide much scope for installing thermal storage heaters of the requisite capacity to meet the requirements of the household. However, there was still considerable diversity of opinion amongst engineers in the supply industry as to the proper means for the electrical heating of water.

Capt. Hooper expressed his conviction that the reduction in the cost of light would mean that the public would utilise more light for the same cost rather than the same amount of light at a lesser cost.

Already there were 1,500 miles of main traffic routes lighted with electric-discharge lamps. There was no town which had tackled the problem fundamentally in the same way as Birmingham.

Following references to cooker improvements and developments in high-voltage cable design, Capt. Hooper stated that harm was done by failure to discuss critical situations openly. Great as was the present distribution controversy, it would sink into historical insignificence with the advent of the major problem of how the industry should be controlled in future.

The speaker proceeded to enumerate some of the advantages of the present system of ownership and control, concluding with some of possible benefits of public ownership. This ensured greater interest on the part of the consumers, as they were the real owners.

The ideal consideration was to provide electricity as freely as water and other health services. As these were a "rate charge" so electricity should eventually be the same.

Air Conditioning in America

THE development of the air-conditioning load in the United States was the subject of a paper by Capt. J. C. Chaytor which was read at the Birmingham Electric Club on October 25th. The author emphasised that climatic and other conditions precluded a true comparison being made with the development of this load in Great Britain, and drew attention to the need for a clear definition in this country if the public were not to be misled and development of the load restricted. Under residential air conditioning unit room coolers and attic ventilators were mentioned in addition to the development of true air conditioning.

Up-to-date figures were given for the annual growth in "horse-power connected" of air-conditioning installations, showing roughly a 50 per cent. growth each year during the last four years. This growth was analysed in the case of several of the larger cities, including New York, Chicago and Washington. From the electrical utility viewpoint the cost of connecting the load and the annual revenue were cited, a ratio of five to one being general. Considerable increases in "down town" distribution networks had been necessary to meet this growing demand. Evidence was given of the promotional work undertaken by the utilities and of their co-operation with the manufacturers. In spite of the seasonal demand at present, most utilities were welcoming the load and trying to find ways and means of filling in the valleys of the load chart.

The author strongly recommended enthusiasm for true air conditioning by all electrical interests in Great Britain, where, owing to climatic conditions, the heating load would help to give a better annual revenue than in the States, and he particularly emphasised the advantage we had in fostering the sale of British-made unit air conditioners because they fulfilled a concrete public want, they produced highly profitable revenue to the electric supply industry, and they were by far the easiest type of air-conditioning equipment to sell.

Cooking Peaks.—Mr. D. H. Parry, of Leicester, delivered his chairman's address at the opening meeting of the East Midland Sub-Centre of the Institution of Electrical Engineers at Loughborough College on October 5th. Speaking of the domestic uses of electricity, Mr. Parry said the bulk of the load came from cooking, space and water heating. He had found from a load curve at Leicester power station that it was the habit of most people in Leicester to cook at mid-day. The result was a peak load at the station which, on certain days of the week, amounted to 0.75 kW for every cooker installed. On Sundays, he added, the peak load amounted to 1.75 kW.

Measurement of Lighting
Recent Progress
Air Conditioning Figures

Electricity in the Dairy

A review of exhibits at the Royal Agricultural Hall, and Olympia, London

Many manufacturers are meeting the demand for dairy equipment created by rural electrification

WHILE it is to be deplored that the British Dairy Farmers' Association and the National Dairymen's Association should have thought fit to hold separate dairy shows in London simultaneously last week, the two exhibitions between them have given visitors an unprecedented opportunity of seeing new electrical equipment for the farm and dairy. For such similar exhibitions it was surprising how little they overlapped. True, there was a certain amount of duplication with regard to bottle washers, cappers and fillers and similar equipment for the distribution side of the industry, but, whereas the B.D.F.A. at the Agricultural Hall concentrated more on the farming side, the N.D.A.'s display at Olympia was concerned largely with distribution, in particular refrigeration, storage and ice-cream production.

Dealing first with the Agricultural Hall, we found a growing appreciation of the advantages of electric milkers, which are being produced by an ever-growing number of manufacturers, among them Alfa-Laval, Fullwood & Bland, Gascoignes, Simplex Dairy Equipment Co., Vaccar, J. & R. Wallace and the International Harvester Co. (which makes a portable apparatus). Farmers are also availing themselves of the electric milk coolers, pasteurisers, sterilisers, &c., that such makers as Aveling-Barford, Perkins and Nathans have to offer.

Any number of electric bottle-washing machines were to be found, ranging from the one-bottle equipment, such as the Dairy Outfit Co. showed, to Powley & Sons' 3,000 bottles an hour machine (giving ten minutes' wash with water at two temperatures), and the still faster 10,000 bottles an hour Grabham apparatus. Other up-to-date types were displayed by Aveling-Barford, Clayton, Cockx, Hill's of Hull, and Perkins. A stoutly constructed washing-up trough is a product of Martin's Cultivator Co. Beatty Bros. and Listers showed electric pumps.

A general view of a portion of the main hall at the National Dairymen's Association's Dairy Show and Ice Cream Exhibition at Olympia, London [*Elec. Rev. photo.*

Bottling and capping can be done at the rate of 4,800 an hour on a Webster machine shown. Dawson Bros. had a slightly smaller model on view capable of handling 3,200 bottles per hour. Perkins and Cockx demonstrated smaller machines.

Electric cream separators were shown by Listers and Wolseley, who, like Cooper-Stewart, also produce horse and cattle shearing apparatus. Butter moulders and wrappers are made by G. Llewellin & Son and Thomson, Sunderland & Co.

A comprehensive exhibit by the General Electric Co. comprised sterilising chests, steam raisers, water heaters, milk-cooling plant, bottle washers, fans for cowshed ventilation, and fractional h.p. motors for milkers, incubators, pumps, &c. Clare's Service and the Dairy Supply Co. also had general displays.

The problem of providing green fodder for live stock during the winter or on ships can be largely solved to-day by using such apparatus as the Electro-Horticultural Equipment Co.'s sprout process cabinets, one of which was shown by J. W. Woolley & Co., Ltd. Intensive Cultivations demonstrated a similar process at Olympia.

Developments still continue with a view to rendering electric incubators even more foolproof and we were particularly interested in the design of the latest Papworth models. These have been fitted with two separate thermostats set to operate at 100 deg. and 101 deg. F., the one set for the higher temperature ringing a bell when it is called into action. A humidistat is also included in the control equipment, other features being easy cleaning, a switch incorporated in the door, the flexible steel conduit covering all the wiring, carefully planned ventilation, illumination by means of a tubular lamp and joltless turning gear with an easily adjustable chain.

A new type of thermostat is used in the latest Neave "Primula" incubators and minor improvements were noticeable in some of the other makes, which included A. H. Bull ("Buckeye"), Curfew, Petersime, Secura and Stephens, the last mentioned showing a 24,000-egg model. Besides incubators H. W. Stephens makes electric brooders, which are also a product of the Visi-Chick Brooder Co., Ltd. Both Nelco and Wiltshire Egg Producers, Ltd., displayed egg graders and testers, and demonstrations of poultry plucking were given by Bingham Appliances and Comb-Pluckers.

Two lightning artists attracted much attention to the British Electrical Development Association's stand.

For milk delivery work electric vehicles are rapidly coming into favour. Some of the latest types were shown by Electricars, Morrison, Metropolitan-Vickers and Murphy. At Olympia we noticed a new Wilson model, the "Bull-dog," designed for "abuse-proof" handling. New types of pedestrian controlled delivery prams were presented by T. H. Lewis, and other developments were disclosed by the Electric Truck & Battery Co. and the Corporation of Electric Transport.

Ice-cream equipment captured a large share of interest at Olympia. Frigidaire have much improved the appearance of their freezers and storage cabinets, and a new feature of the Ernest West & Beynon "Verikold" apparatus is a specially designed refrigerated vessel for ageing and storage. A 150-gal. per hour continuous freezer was shown for the first time by the Creamery Package Mfg. Co. and a new insert tank was among the comprehensive Lightfoot display. We liked the neat appearance of the latest Kelvinator models. Both the International Refrigerator Co. and the Pressed Steel Co. have new conservators. Emulsifiers were exhibited by Joe Lowe Food Products and G. C. Hurrell. Automatic cup-filling machines were demonstrated by Dorset Industries, and Century reported many orders for its ice-cream vending machine.

The General Utility Co., Marco, Sterne, Leda and Consol Products make a speciality of complete milk bars, and British Automatic Refrigerators showed one model fitted with electrically heated and thermostatically controlled soup containers. Outstanding features of the British Super-Cold display cases are the incorporation of a coil running the full length of the shelves, humidity control and non-transference of odour. Refrigeration equipment of all types was represented by York Shipley.

Dairy equipment was much the same as at the Agricultural Hall, but the extra space available allowed such larger apparatus as the Hopkins conveyors and elevators to be included. A portable milk cooler was shown working by the Pressed Steel Co., while J. & E. Hall drew attention to a plant capable of cooling at the rate of 27 gal. per hour and upwards. Large can washers were shown by the "Double W" Dairy Equipment Co., and among those with bottle-filling and capping machines were Gunnar Hartmann, the Alexandra Separator Co., R. W. Webster, Albro and Graham Enock. Complete dairy equipment can be supplied by Cherry-Burrell and Alka.

For the production of low-priced "process creams" homogenisers are now being made by the Brush Electrical Engineering Co. and British Emulsifiers.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Mobile Sub-station for Use Underground

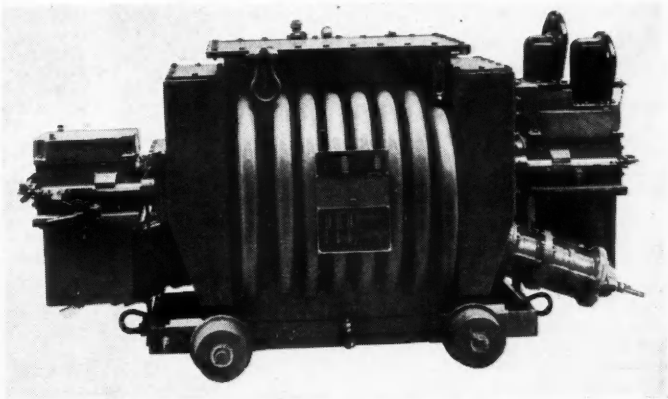
Colliery engineers are discovering the usefulness and economy of the "transwitch" unit made by SWITCHGEAR & COWANS, LTD., Old Trafford, Manchester, incorporating a 75-kVA, 3,300/550-V mining type transformer. The simple and compact layout reduces the "overhang" of the switchgear and also the overall height to the minimum. Although one circuit breaker is fitted with two flameproof instruments, there is very little encroachment on the overall height. An important consideration in iow headroom workings.

The switchgear is mounted on the transformer by means of large steel connection pockets at each end of the transformer. The main terminals of the transformer are brought into the pockets through oil-tight bushings and connected to the terminals of the isolating plug box and cable box which are bolted to the pockets. When connecting up is completed, the pockets are filled with insulating compound.

In accordance with the regulations governing mining type transformers the neutral point of the secondary side is brought out to a substantial detachable link which is protected by a steel plate cover with wide machined flanges.

The high-voltage end is controlled by a flameproof 100-A drawout type circuit-breaker equipment having overload releases and oil dashpot time lags. The low-voltage breaker is of a similar type of 200-A capacity and has, in addition, leakage protection and an ammeter.

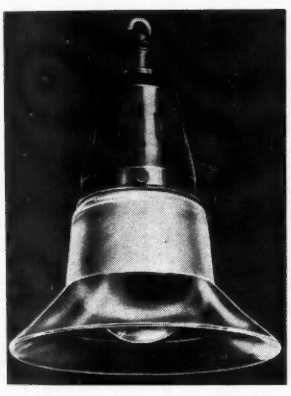
While the unit illustrated is of 75 kVA capacity with circuit-breakers rated accordingly, larger units can be manufactured incorporating breakers of higher current ratings and rupturing capacities, and the design of the circuit-breaker units is such that similar assemblies can be fitted to all makes of mining type transformer.



The S. & C. mobile sub-station for underground service. The high voltage end is on the right

A Factory Lighting Unit

A reasonable degree of ceiling and upper-wall illumination would more often be provided in factories and similar working places if it could be achieved without increasing the wattage or diminishing the light normally directed downward on to the working plane.



The Amplilux bell-shaped factory fitting

This object is now attainable by means of a new fitting produced by the AMPLILUX LIGHTING & ILLUMINATION CO., LTD., 12, Grosvenor Gardens, London, S.W.1, whose prismatic ring was described in our issue of August 13th last. The same principle has now been extended to bell-shaped glass fittings into which the reflecting ring is cast as an integral part, as here illustrated.

The flanges of the bell thus constitute a prism, the angles being accurately calculated so that all the light which passes through it reaches the outer inclined surface at an angle greater than the angle of total internal reflection. This light is, therefore, redirected downward and outward, equal, in every way to that obtained from the more orthodox vitreous enamelled reflector. Viewed from the side, of course, the prism appears to be opaque, and this effect continues downward to give the usually accepted angle of cut-off of 70 deg. But, as the reflective power of prismatic glass is so much greater than that of vitreous enamel, the foregoing effect is achieved with only a portion of the available light. When the lamp is in the correct position in the bell unit the filament is opposite to the *top* of the flange, and all light leaving the filament above the horizontal is free to pass upward.

To ensure the diffusion of this top light, the upper portion of the bell is frosted, permitting the ceiling to act as a reflector with an improvement in general illumination that materially contributes to cheerfulness of atmosphere, in addition to its effect on the efficiency of the workers. Also, prismatic glass, seen against an illuminated ceiling, is much easier to look at than is bright vitreous enamel against a background of darkness, the diminution of glare and excessive contrasts preventing eye strain.

Apart from factories, this new unit has a variety of potential uses. The top illumination provided would be of great help, for instance, in warehouses, where difficulty is frequently encountered in deciphering figures on labels or stock cards in narrow passages where goods are stored; and the attractive appearance of the prismatic bell also makes it suitable for shop windows.

The glass used is very tough to withstand heat and mechanical shocks. As the reflective action of the flanges is based on total *internal* reflection, dust collecting on the top has no apparent effect on their efficiency, and glass does not tarnish or deteriorate.

Motor Developments

A tandem lift motor giving silent two-speed lift drive from a single shaft is a development by BROOK MOTORS, LTD., Huddersfield. The main driving motor is usually of the slip-ring type running at 1,000 r.p.m. synchronous. Imposed upon it is a "super-silent decking" motor running at 500 or 375 r.p.m. and driving on to the main shaft through a 2 to 1 V-belt reduction. Final driving shaft speeds of 920 and 175 r.p.m. are thus obtainable.

The Brook tandem lift motor

The company also announces that 1½ h.p. (1,500 r.p.m.) squirrel-cage motors and 1 h.p. (1,500 r.p.m.) slip-ring motors can now be obtained in its flameproof series.

A "Daylight" Reflector

A development by DAYLIGHT ALLOY REFLECTORS, 50, Ludgate Hill, London, E.C.4, is a reflector designed to give a "daylight" effect from ordinary tungsten filament lamps without the use of coloured glass.

The "Daylight" alloy reflector

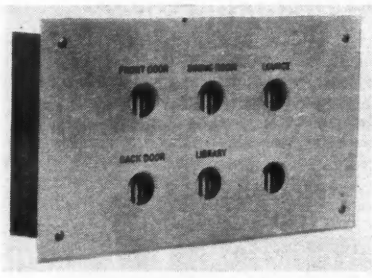
This reflector is bluish in colour, being made of specially treated spun metal. It fits over the lamp in the usual way, producing a light containing a high percentage of blue without undue absorption.

Types can be supplied ranging from large shop window units to desk lamp reflectors and special units for lathes, &c.

E

A Domestic Bell Indicator

A new pendulum indicator, specially designed for domestic use, has been introduced by GENT & CO., LTD., Faraday Works, Leicester.



The "Gent" domestic bell indicator

It is a departure from the more conventional wood-cased type mounted on the surface of the wall as it is arranged for sunk fixing with an engraved brass plate bronzed or enamelled cream, or to instructions. The indicator is, therefore, in keeping with the modern tendency towards smooth surfaces and, incidentally, the elimination of dust traps. This equipment can also be obtained in the form of drop indicator.

A General Purpose Inspection Lamp

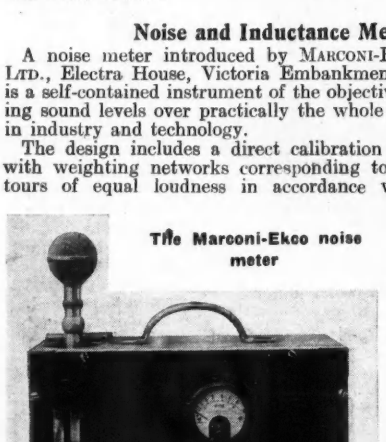
Described as a "most versatile lamp for garage and home," the "Nearlite" inspection lamp produced by STADIUM, LTD., 75-77, Paul Street, London, E.C.2, appears to have many other applications for factories and industrial use. It can be placed as near as desired to the work in hand, gripping any surface securely without damage. The clip can be fixed with one hand. Double ball joints permit adjustment to any angle and there is no base to occupy bench space. The Home Office pattern Crabtree switch and adaptor incorporated in the lamp is fitted with a protective skirt heavily insulated from the metal shade. The adaptor is designed to withstand the effects of oil, acid and water, while a neat cord grip minimises risk of breakages and short circuits.

The Stadium "Nearlite" inspection lamp

Noise and Inductance Meters

A noise meter introduced by MARCONI-EKCO INSTRUMENTS, LTD., Electra House, Victoria Embankment, London, W.C.2, is a self-contained instrument of the objective type for measuring sound levels over practically the whole range encountered in industry and technology.

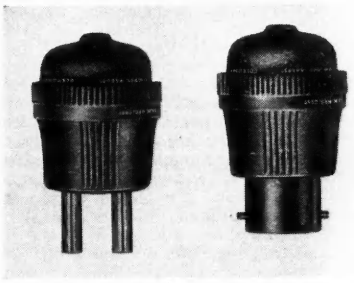
The design includes a direct calibration in phons together with weighting networks corresponding to 40 to 70 db contours of equal loudness in accordance with Fletcher and Munson. A flat frequency response can also be selected. The instrument includes a non-directional microphone of the piezo-electric type which can be replaced by a vibration pick-up should it be desired to make direct contact with the vibrating member. A filter unit will also be available in the near future in order that an approximate frequency analysis of the noise may be obtained. One of the applications of this instrument in the electrical field where it is of considerable value is in the measurement of transformer noise.


The Marconi-Ekco noise meter

Another new Marconi-Ekco device is a direct reading inductance meter for the measurement of large self-inductances with or without polarising current. The measurement is based on the effective inductance of the test coil in terms of test impedance at 50 c.p.s. A source of variable voltage is used, passing a standard current through the test coil, and range switching is obtained by low current transformer having three primary windings. The voltage control is calibrated directly in effective inductance and the instrument has three ranges for measurements from 0.5 to 1,000 henries. The polarising current is up to 500 mA d.c. for measurement of 100 henries and to 50 mA up to 1,000 henries.

Improved Plug Adaptor

Improvements in the "Presto" combined plug and lampholder adaptor have been announced by WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester, 6.


The "Presto" adaptor

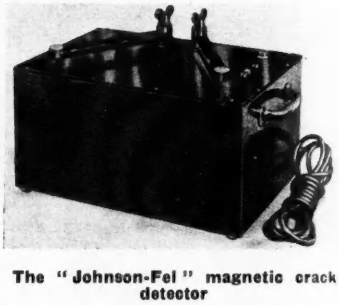
The new type is of different appearance, having a body of greater diameter and is more robust in construction. There are no loose parts or springs. It fits all standard 5-A, 2-pin sockets and b.c. lampholders, a turn in one direction effecting the change from a plug to lampholder adaptor, or *vice versa*. The adaptor, which is made of bakelite, is obtainaable in ebony, brown or walnut finish.

High-voltage Valve Holder

A recent introduction by BELLING & LEE, LTD., Cambridge Arterial Road, Enfield, is a high-voltage valve holder. It is a bakelite moulding which allows exceptionally long creepage distances without greatly increasing the dimensions. This design has been brought out specially for television receivers where rectifier valves may carry peaks of 11,000 V from the pins to the chassis. Fixing holes are in accordance with the R.C.M.F. standards, and it can be fitted above or below a 1¼in. diameter hole in the chassis. The sockets are silver-plated.

Magnetic Crack Detector

For enabling ferrous materials to be examined for surface defects at any stage of manufacture the "Johnson-Fel" magnetic crack detector has been designed as a self-contained portable instrument that can be connected up to the nearest suitable a.c. circuit. It is housed in an oak cabinet with polished black fibre top bearing two brass arms with an adjustable range of 23 in. for taking varying shapes, a push-button switch and two 4-V pilot lamps. One lamp indicates correct connection to the main supply and the other that the specimen has been magnetised (de-magnetising after testing is unnecessary). After depressing the push-button the article is removed and sprinkled with a special powder or solution, the excess of which is removed revealing clear indications of any defects. The apparatus is manufactured by FEL-ELECTRIC, Garden, Street, Sheffield.


The "Johnson-Fel" magnetic crack detector

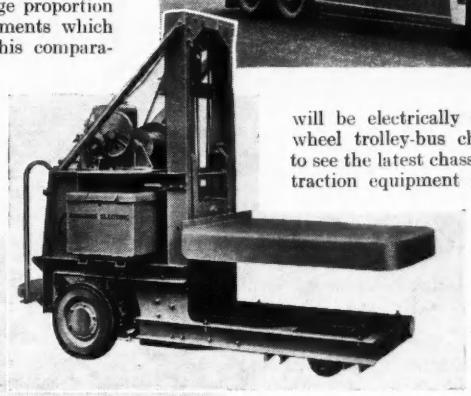
Two new table standards selected from a range which has been introduced by A. J. Andrews, Gamage Buildings, London, E.C.1

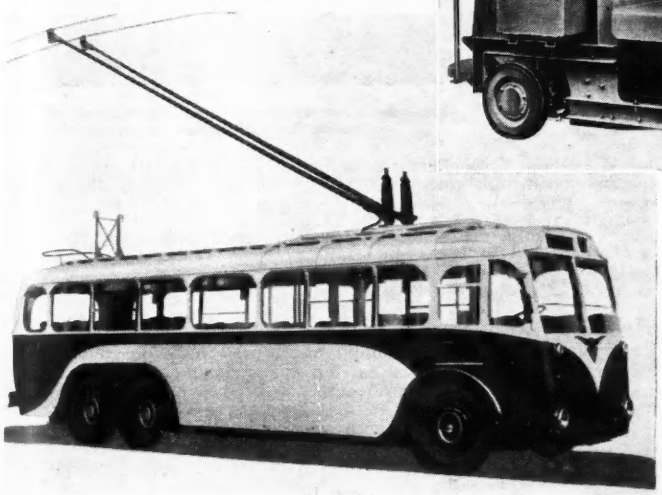
Trolley-bus Developments

Things to look for at next week's Commercial Motor Show

THE two years that have elapsed since the last International Commercial Motor Transport Exhibition have witnessed the abandonment of many tramway systems and the substitution of trolley-buses. Many more transport undertakings are either contemplating or are in the process of similar conversions. Visitors to this year's exhibition, which opens at Earls Court next Thursday and continues until November 13th, are therefore likely to find a large proportion of interest concentrated on the various developments which have taken place recently towards perfecting this comparatively new form of transport.

The improvements noticeable will generally take the form of detail modifications rather than radical alterations in design. A novel arrangement of series dynamic electrical control equipment housed in a compartment at the rear is, for example, a feature of the latest





A.E.C.-English Electric 39-seater single-deck, central entrance trolley-bus. The chassis is of the 3-axle type with fully floating type rear axles, and the contactors, control gear and resistances are readily accessible through rear doors, and are removable as a single unit. The 100-h.p. E.E.C. traction motor

From top to bottom: Sunbeam-B.T.H. "M.S.2" trolley 'bus, Ransomes "TNU" 2-ton tiering truck, A.E.C.-English Electric 39-seater single-decker and a 70-seater Leyland vehicle

permits speeds up to 40 m.p.h. and has very good acceleration. The low-voltage dynamo is directly driven from the main motor.

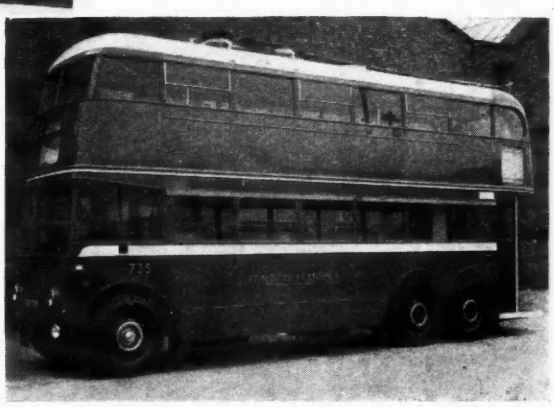
To meet modern operating requirements, particularly as regards insulation, another A.E.C.-E.E.C. vehicle to be shown, a 56-seater double-decker for Bradford Corporation, is of all-metal construction, free from "drumming" and with maintenance reduced to a minimum. Four-wheel air brakes are operated by an E.E. compressor motor. The 80-h.p. traction motor is ventilated by filtered air drawn from the side of the vehicle and the system of control utilises a lightly compounded motor offering the characteristics of a series motor combined with the stable rheostatic braking possible with a compound machine, but avoiding returning heavy regenerated current to the line.

Built to the specification of the London Passenger Transport Board, a 3-axle 70-seater Leyland vehicle has 90-h.p. A.M.E.T.E.L. electrical equipment mounted amidships and arranged for regenerative braking on a backward movement of the power pedal and rheostatic braking followed by compressed air braking on the brake pedal. The brakes are fitted with a low-pressure air alarm, anti-freezer and an arrangement for reducing the noise of the compressor. The 30-V lighting dynamo is belt driven from the motor shaft. Other features are frame-mounted electro-magnetic contactors, and radio anti-interference coils.

All the vehicles on the Sunbeam Commercial Vehicles stand will be electrically driven. An "MS2" six-wheel trolley-bus chassis will enable visitors to see the latest chassis design, with the B.T.H. traction equipment arranged for regenerative and rheostatic braking. Low voltage lighting and battery manœuvring are provided. Three complete double-deckers to be exhibited form part of repeat orders from Walsall, Wolverhampton and Johannesburg.

An entirely new Sunbeam product is a 12-15-cwt. battery-driven goods delivery vehicle, controlled by contactors of similar design to those used on the company's trolley-buses. The master control is pedal actuated leaving both hands free for steering, etc. This vehicle will be shown both in chassis form and with a van body.

Ransomes, Sims & Jefferies, Ltd., claim that the motor used in the larger of two trolley-bus chassis which they will be showing constitutes a record so far as lightness is concerned. Of the company's own manufacture it is series wound with field regulated system of control and weighs less than 900 lb., with a rated output of 80 h.p. The control gear is



of the Crompton-West contactor type. This chassis, which is designed for a double-deck body, is provided with four-wheel pressure brakes. The lamps are supplied by a dynamo driven directly by the main motor and radio interference suppressors are provided.

In view of the special circumstances in which a smaller chassis designed for a single-deck body seating twenty-four passengers will operate, rheostatic braking is provided actuated from the same pedal as the usual mechanical foot brake. The 35-h.p. motor and the other electrical equipment are similar to those of the larger vehicle.

Apart from trolley-buses Ransomes will be showing a number of their battery-driven industrial electric trucks including the "TNU" 2-ton tiering truck. This is provided with foot operated control and safety interlocking gear to prevent simultaneous application of the power and braking. The platform top steel plate is fitted with elevating gear actuated by a separate motor with an automatic cut-off device which operates when the platform reaches either the top or bottom. An

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Employment During September

Employment during September in the engineering industry showed little change and was good on the whole remaining very good in electrical engineering. According to the *Ministry of Labour Gazette* the total number out of work in the engineering industry was 56,000, a decrease of 2,190 as compared with the preceding month, and 14,551 fewer than in the corresponding month of 1936, the percentage being 5.3. In the electrical engineering section the number of unemployed was 3,130 or 3.1 per cent. (against 3.6 per cent. in September, 1936). The unemployed in the electrical wiring and contracting industry numbered 3,765 or 9.9 per cent. (10.8 per cent. in September, 1936). In the cables, apparatus, lamps, &c., group the unemployed numbered 6,649, the percentage falling from 4.5 to 4.4 (4.7 per cent. in September, 1936).

Dairy Sterilisers

In order to encourage the development of the electric steriliser load, J. W. Woolley & Co., Ltd., have published a small handbook on dairy sterilisers by Capt. Chaytor, formerly engineer to the Tamworth undertaking. It is intended for use by sales staffs of small electricity undertakings which have rural areas but cannot afford specialist agricultural engineers. There are twenty-three pages, illustrated and bound in a stiff cover.

Diaries

The 1938 issues of *The Amateur Photographer*, *The Motor Cycle*, *The Wireless World*, and *The Autocar* diaries are now obtainable from Iliffe & Sons Ltd., or from booksellers and stationers, at 1s. 6d. net. Each contains a great deal of useful information which should be of considerable value to readers of these journals and to others who are interested in the subjects which they cover. The diary of *The Amateur Photographer* is neatly bound in dark red leatherette, and the other three have navy-blue bindings.

Specially designed G.E.C. lighting fittings at Burslem Town Hall

A Church Lighting Installation

A new lighting system has recently been installed in Gatley Methodist Church. This consists of large type Holophane "Extensolite" troughs which are fitted on the front side of the roof beams, the lighting being projected forward and downward. These troughs, with a special diffusing glass, give an ideal lighting effect of high intensity, without the beam effect noticeable with floodlighting. The main porch is illuminated by means of Holophane chromium plated built-in fittings.

Gatley Methodist Church illuminated by Holophane "Extensolite" troughs

Burslem Town Hall Lighting

Burslem Town Hall, one of six civic centres administered by the Stoke-on-Trent City Council, has just been renovated and relighted throughout. These alterations have resulted in the complete modernisation of this building, which was built in 1910. The designs for the redecoration scheme were prepared by the City Architect's Department under the direction of Mr. J. R. Piggott, while the electrical scheme was prepared by the City Electrical Engineer's Department under the direction of Mr. C. H. Yeaman, and carried out by Blackburn, Starling & Co., Ltd., of Hanley. The General Electric Co., Ltd., was entrusted with the manufacture and supply of most of the lighting fittings for the Town Hall, which embraces a number of small halls, committee rooms, and corridors, "Osram" lamps being used throughout. The fittings installed in the main hall are 5 ft. 6 in. in diameter. The metalwork is finished in bronze colour with champagne glassware, flashed opal etched, with panels in white "raindrop" glass. They are fitted with special extension barrels and double eye for lowering gear. The fittings installed over the gallery are designed to match the main hall pendants. For the ground-floor corridors surrounding the hall white opal glassware fittings with sprayed bronze metalwork are installed. The units installed in the smaller halls are 14 in. in diameter, the metalwork having a bronze finish, low absorption glassware with amber-coloured glass fins being fitted. A total of 139 fittings was supplied, the spacing being in accordance with modern illumination practice.

Trolley-bus Developments *(Concluded from previous page)*

"ENU" 2-ton truck will also be on view, as well as specimens of truck driving units and elevating gear.

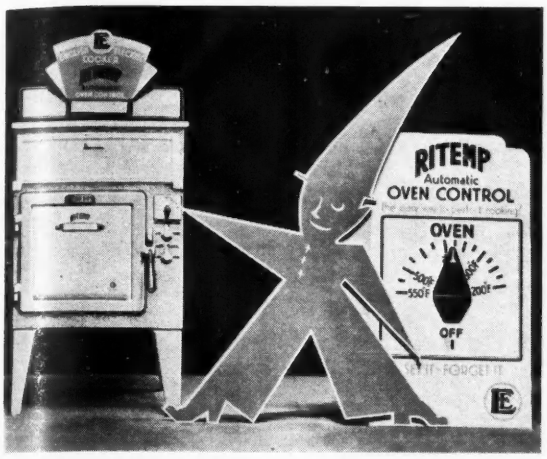
An opportunity will be given of inspecting one of the latest double-deck Crossley trolley-buses as well as a chassis. An "E4" four-wheel chassis suitable for 56-58 seats will be an interesting Karrier exhibit. It has a 80-h.p. Metropolitan-Vickers motor and a differential electric and air pressure braking system. A double-deck body will be shown mounted on a similar chassis and there will also be a "E6a" six-wheel chassis fitted with a 60-seater double-deck all-metal body, with front and rear entrances and pneumatically controlled doors. Petrol driven commercial chassis and complete vans for all purposes will be presented by Morris Commercial Cars, Ltd.

Electrical equipment for petrol driven vehicles will be well represented on the stands of such manufacturers as the British Thomson-Houston Co., Ltd., and C.A.V.-Bosch. Lodge Plugs, Ltd., will be drawing special attention to the "C.V." plug designed to stand up to the exacting running conditions of heavy commercial vehicles, and "Green Dualode" batteries for trolley-bus manœuvring will be shown for the first time by the D.P. Battery Co., Ltd.

Although not exhibiting any entirely new products, David Brown & Sons (Huddersfield), Ltd., will show the results of much development work in connection with special plant for the automobile and other engineering industries, especially that used in the manufacture of their special worm gear. Demonstrations of oxy-acetylene welding and cutting will be given by the British Oxygen Co., Ltd.

Two Window Displays

The accompanying illustration shows one of two window displays which the English Electric Co., Ltd., has produced for use in its customers' showroom windows. The display has been specially designed to "tie up" with the symbolic figure of the "Electric Man" devised by E.D.A., and draws attention to the "Ritemp" automatic oven-heat control now being



An electric cooker window display prepared by the English Electric Co., Ltd.

largely incorporated in English Electric cookers. The other display is of electric fires and is finished in bright, warm colours. A rich glow reflected on the apparel of two figures gives a realistic impression of "instant, healthy warmth," which is the keynote of the display.

New British Aluminium Works

The Glasgow correspondent of the *Financial Times* reports that the Executive Committee of the Ayrshire Development Council has received intimation that the British Aluminium Co. has decided that conditions in Ayrshire are not such as would justify its new works being erected in the county. The Committee had been in communication with the company, which desired a 100-acre site to set up a factory for the manufacture of alumina for use in the production of aluminium. A site was found between Stevenston and Ardrossan and it was thought by the Committee that the company was satisfied. The directors of the British Aluminium Co., however, have decided in favour of a site at Newport, Mon.

Exhibition Farms

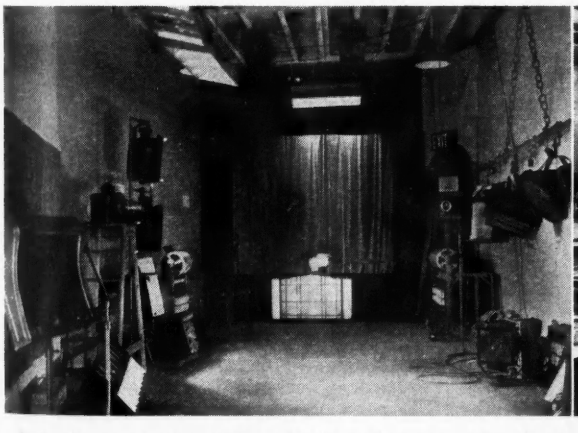
Among the feature displays at the Golden Gate International Exposition and the New York World's Fair in 1939 will be electrified farms, complete in all details, states the official organ of the American Institute of Electrical Engineers. With an estimated 1,118,000 farms in the United States served with electric power, these exhibits are expected to have wide significance in their demonstration of the possibilities of efficient and effective utilisation of electrical energy in house, barn, dairy, shop and field. It is expected that crops will be growing and fruit trees will have been established before the World's Fair opens. The exhibit at the Golden Gate Exposition will be in the Palace of Electricity, where a model farm, completely electrified for operations from dish-washing to forced crop production, will include demonstrations of protection against insects and walnut and prune dehydrators.

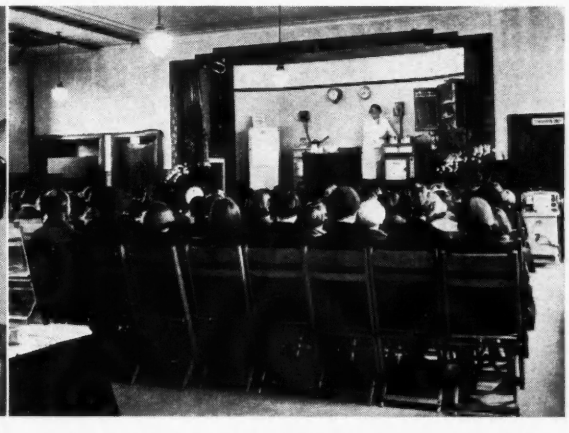
Electricity for Shop Lighting

The British Electrical Development Association has prepared a booklet with the title, "People Stop at the Well-Lit Shop," which it is issuing as a supplement to the Better Light—Better Sight Campaign. This contains information relating to after-hour lighting, recommended intensities for various areas of a town and recommended shop lighting schemes for particular trades. Copies of the booklet can be supplied to any undertaking at 12s. 6d. per 100, or £6 per 1,000. The Association's

Electrical Propaganda at Manchester

THE Manchester Corporation Electricity Department has always been noted for its progressive sales policy, and the exhibitions held from time to time in its demonstration workshop are well known. The latest exhibition, held there from October 5th-14th, broke new ground by dealing especially with stage lighting and floodlighting equipment. The exhibition was held with the co-operation of the Strand Electric and Engineering Co., its object being to introduce to shops and warehouses, amateur dramatic societies, &c., the facilities which are available, any of the equipment shown being obtainable on hire from the manufacturers at reasonable rates. Invitation cards were sent to a selected mailing list, with letters bringing specific sections of the exhibition to the notice of the individual to whom the particular circular was addressed.





Left: A general view of the exhibition of stage and floodlighting equipment recently held at the Manchester Corporation demonstration workshop. Right: A cooking demonstration for children held during the Blackley, Manchester, electrical exhibition

The exhibition was supplemented by a lecture by Mr. L. G. Applebee, of the Theatre Lighting Department of the Strand Electric and Engineering Co. To make the demonstration workshop resemble more closely a theatre, the walls and permanent electrical equipment were disguised by means of hessian draped over ordinary stage flats. At one end of the room a stage was erected, complete with "tubs," stage drapes, and four-colour footlights and battens. All the stage-lighting equipment was controlled from a 12-way portable dimmer board. At the back of the stage there was a small cyclorama. Arranged along one wall was a towing bar, which comprised a 1½-in. steel barrel to which twelve brackets were clamped, the bar being wired through to a connecting box at one end from which a twelve-pair fireproof cable terminated on to another portable dimmer board. On the brackets were suspended various types of 500-W and 1,000-W stage flood- and spotlights. On the opposite wall were several examples of glass and acetate letters for interchangeable programme announcements, together with two examples of neon signs. Down the centre of the room, suspended from the ceiling, were several types of arena floodlights, each using 1,000-W gas-filled lamps. In the centre of the workshop was erected a transportable illuminated fountain. There were also three examples of "noise-making" machines (wind, surf and aeroplanes).

Mr. Applebee's lecture was entitled "Colour and Direction of Light as Applied to the Stage." He traced the history of the art of stage lighting from the days of the Greeks. During the ten days of the exhibition it was visited by nearly 400 people.

Another field of electrical activity which the Electricity Department is cultivating is the education of the rising generation in the domestic uses of electricity, and at an electrical exhibition held recently at Blackley a cookery demonstration was given to schoolchildren. During the mornings also girl pupils from local schools were shown round the exhibition and were given short lectures and demonstrations on the various exhibits. It has been the policy of the Department for some years to hold a series of exhibitions and demonstrations each winter, and the one at Blackley is the first of six which are being given during the winter in small local halls, each for a period of three days.

larger treatise on "How to Light the Modern Shop" is still in circulation.

Hackney Nurses' Home

As a part of the London County Council's extensive scheme for improving conditions in its hospitals a new nurses' home costing nearly £100,000 was officially opened at Hackney Hospital recently by Mr. Herbert Morrison. With six floors fronting Sidney Street, the new building provides accommodation for 265 nurses and comprises a dining-room, three recreation rooms, bathrooms, self-contained flats for the matron and deputy matron, private sitting-rooms for the administrative nurses, a lecture room, demonstration room and library. In addition nurses have the use of special shampoo rooms and small laundries where "Magnet" hairdryers and irons are provided. So that they shall not be left on circuit inadvertently the latter are supplied through prepayment meters, the coins being recoverable. Philips radio sets are installed in the recreation rooms and separate call bell and fire alarm systems (Julius Sax) are provided in the corridors, where there are also sockets for vacuum cleaners. Automatic telephones are connected up with a Reliance system in the hospital itself. In the servery adjoining the dining-hall perishable foodstuffs can be stored in a large B.T.H. refrigerator and crockery, &c., can be quickly washed by one of the latest Hobart machines. Appropriate lighting fittings throughout the building were supplied principally by Osler & Faraday, Ltd.; Frederick Thomas & Co., Ltd.; Siemens Electric Lamps & Supplies, Ltd.; and Benjamin Electric, Ltd. Altogether there are about a thousand lighting and power points in the home, and the electrical installation was carried out by Pinching & Walton, who employed Liverpool wires and cables, Walsall plugs and switches and Kartret fuseboards. Bennie Lifts, Ltd., were responsible for two electric lifts.

Manufacture of Electrical Appliances in the I.F.S.

Steps are being taken for the establishment at Ardee, County Louth, of a factory for the manufacture of electrical plant and appliances. For this purpose a company with a nominal capital of £25,000 has been formed and registered, and already a portion of the premises of the Great Northern Railway Co. has been acquired, and the reconstruction of the buildings to suit the requirements of a factory of the kind is to commence immediately.

Works Visit

On October 13th about sixty members of the English Electric Co., Ltd. (Stafford Works) visited the works of the Shelton Iron, Steel and Coal Co. at Stoke-on-Trent. The visit was arranged by the courtesy of Mr. N. H. Rollason, managing director of the company, and the visitors made a tour of inspection.

Scottish Contractors' Year Book

The 1936-37 edition of the Year Book and Diary of the Electrical Contractors' Association of Scotland is now available at 3s. (3s. 6d., post free). As in previous years, there is an alphabetical list of members, which is preceded by the portraits of Mr. H. M. Fulton, the president for 1937-38, the vice-president, secretary, branch chairman and the auditor. There is also a directory of institutions and associations and a good deal of information of particular interest to contractors.

[Elec. Rev. photo.

Viscountess Elibank is one of those who are giving their active support to the Electrical Association for Women's scheme for training domestic servants in electrical matters. Here she is seen (right) with her cook at the first of the classes held at the showrooms of the London Associated Electricity Undertakings, Ltd., at 254, Earl's Court Road, on October 20th

Trained at Henley's

Before achieving fame as a British film producer, Mr. Alfred J. Hitchcock—who has just completed "Young and Innocent" with Nova Pilbeam—was with Henley's Telegraph Works, serving under Mr. W. A. Moore. He entered the company's service in 1914 as a junior in the Sales Department, and later was transferred to the Advertising Department. In those days he was a producer of advertisements for electric cables. He left Henley's in 1921 to take charge of the art title department of an Anglo-American producing company. Mr. Moore has sent us a photoprint of one of Mr. Hitchcock's advertisement lay-outs which he has recently come across.

A Hack-saw Display Stand

Fry's (London), Ltd., have introduced an attractive display stand which is being issued to stockists of "Enox" hack-saw blades. The colour scheme employed is light and dark green with gold and black lettering. The main feature is that the blade is bent into a semi-circle demonstrating its flexibility. The stand is offered free to dealers stocking five gross of blades.

A display stand issued by Fry's (London), Ltd.

A Large Public Address System

The public address system installed at the new Earls Court Exhibition Buildings has been the subject of much favourable comment. The installation, which is one of the largest in this country, was carried out by Bright and Preston Relay Station, Ltd. The loud speakers used are Benjamin Model 66 (manufactured under Magnavox patents), of which 150 are installed. The G.E.C. amplifiers are capable of delivering about 1 kW of speech or music.

The Metric System

The Decimal Association is making a detailed examination of the use of the metric system and its further possibilities in the electrical industry, and it will welcome the co-operation of firms willing to supply information as to the application of the system in their own concerns.

An Autumn Window Display

In our last issue we illustrated a selection of electric fires which forms part of the autumn window display of the General Electric Co., Ltd. This display is at Magnet House, Kingsway, W.C.2, and not at Newcastle as stated.

The Cardiff Engineering Exhibition

The Cardiff Engineering Exhibition organised by the South Wales Institute of Engineers is to be held at Greyfriars Hall, Cardiff, from November 17th to 27th. As in previous years many of the exhibitors will devote their stands to engineering and electrical equipment designed for use in the steelworks and collieries of South Wales.

Orders Recently Booked

Crossley Motors, Ltd., has received an order for twenty trolley-bus chassis for Hull Corporation. The value of the contract is £20,000.

Twenty-two electric locomotives now being built by the Metropolitan-Vickers Electrical Co., Ltd., for the South African Railways are to be equipped with Timken tapered roller bearing axle boxes. This is a repeat order. A new sheet mill for stainless steel is to be installed at the Stocksbridge works of Samuel Fox & Co., Ltd., the equipment of which will include four British Timken bearings, each weighing over 8,000 lb.

The Public Works Exhibition

Electrical aids to road safety both in the form of improved street lighting equipment and traffic signals will be a strong feature of the Public Works Exhibition which opens at the Royal Agricultural Hall, Islington, on November 15th. A novel attraction will be a large scale model of Piccadilly Circus demonstrating the new traffic light system shortly to be inaugurated. Specimens of the latest electrical equipment for

road construction, &c., will also be found on several of the three hundred stands. On November 16th, at a conference held under the auspices of the Association of Public Lighting Engineers, Mr. C. H. Woodward, public lighting superintendent, Bournemouth, will read a paper on "Photometry in Public Lighting." Mr. C. I. Winstone, president of the Association, will take the chair.

The "Wireless World"

Commencing with the issue of the "New Readers' Number" dated November 4th, the *Wireless World* will be published on Thursday of each week instead of Friday as hitherto.

Trade Announcements

Runbaken Electrical Products has moved to 13-15, Liverpool Road, Deansgate, Manchester, where there is also a showroom trade counter and service department dealing with all classes of repairs and equipment. The works remain at Hapton.

Mica Elements (1937), Ltd., has recently been formed to purchase the assets of Mica Elements, Ltd., which went into liquidation in August last. The works in Nottingham are being continued, while a London office and depôt has been opened at 19, St. Dunstan's Hill, Gt. Tower Street, E.C.3.

Signs and Traffic Signals

The Ministry of Transport Committee on Traffic Signs recommended that highway authorities should be empowered to secure the removal of objects, including illuminated advertisements, which made it difficult to see traffic signals. A detailed memorandum has now been prepared by the Master Sign Makers' Association which aims at showing that illuminated signs in general do not interfere with the visibility of traffic signals; that where such signs do affect signal visibility a remedy can be effected without legal proceedings or extension of highway authorities' powers; that any control such as is suggested would constitute a hardship to traders and adversely affect the value of property in shopping centres; that already signs are subject to strict control and any extension of this would be prejudicial to the sign business; and that complaints made regarding the adverse effect of illuminated signs on traffic signals are often unjustified. The memorandum makes a very thorough study of the various points raised. It was prepared by a committee comprising Messrs. S. D. Moyse (Claude-General Neon Lights, Ltd.), H. S. Coleman (Sign Construction Co., Ltd.), C. H. Golding (Boro' Electric Signs), E. Harrison (Franco-British Elecl. Co., Ltd.), H. J. Pearce (Pearce Signs, Ltd.), and J. Langdon (secretary).

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the October 1st cost-of-living figure (58 per cent. above the 1914 level) will not involve any alteration in the wages of workers in the industry on the third pay day in November.

An Ice Rink at Covent Garden

What is claimed to be the largest theatre ice rink in the world, 50 ft. by 70 ft., has been constructed at Covent Garden, London, for the ice ballet "Rhapsody on Ice," which opened on Tuesday. No fewer than five miles of piping have been used, separated from the stage boards by successive layers of tarred waterproof boards, four inches of cork, more boards and tarred waterproof, and finally a sheet of rubber. The installation has been carried out by Alpine Rinks, Ltd., who have utilised three 15-h.p. "Prestcold" compressors supplied by the Pressed Steel Co., Ltd.

Social Events

At a recent swimming gala organised by the Sports and Social Organisation of the Automatic Telephone & Electric Co., Ltd., Liverpool, the staff of Elexcel, Ltd., secured the "Strowger" cup for the highest aggregate of points, the ladies' championship cup and a number of other cups and prizes for individual performances. In addition teams representing Messrs. Littlewoods, Crawfords and the Liverpool Corporation Tramways Department were defeated in an invitation squadron race.

Social Events

On Monday, Tuesday and Wednesday this week, the G.E.C. Dramatic Society gave the first amateur performances of "Charity Begins ——," by Ireland Wood, at the Fortune Theatre. This society seems to delight in selecting plays which many amateurs would not attempt, and its latest production comes within this category. The play has few "situations," and relies almost entirely upon characterisation and sparkling dialogue for its success. Its chief commendation to amateur societies is that it provides almost equal chances for each member of the cast. Jessie Smith, Stanley Wells, Patricia Gregory, Norman Pitt, Ronald Farrow, Lilian Ellison, Norah Symonds and Cecilia Ridler all gave sterling performances, while Joan Coltham confirmed the good impression which she created in the previous production. A special ovation was accorded Irene Herod, who stepped into the breach at the last moment and played a difficult part with distinction. The production was the G.E.C. Dramatic Society's annual effort on behalf of the Electrical Trades Commercial Travellers' Association charities.

Prices of Materials

Henry Gardner & Co., Ltd., report, October 27th: Copper bars (best selected), sheet and rod, £80, £4 dec. English pig lead, £20, 10s. inc. Spelter, £17 1s. 3d., 7s. 6d. inc. English block tin, £208 10s., £1 15s. inc.

Frederick Smith & Co. report, October 27th: Electrolytic copper bars, £50, £1 inc. Ditto, ditto, wire rods, £55 10s., £1 inc. Ditto, ditto, h.c. wire, 9⅜d., ¼d. inc. Silicium bronze wire, 9⅜d., ¼d. inc.

Edward Till & Co. report, October 27th: India rubber, Para fine, 8¼d., ¼d. dec.

An Electrical Exhibit at Bethnal Green

The Bethnal Green Electricity Department is taking a prominent part in a Local Industries Exhibition, which the local Chamber of Commerce is now holding (until next Wednesday) at York Hall, Old Ford Road.

For Sale

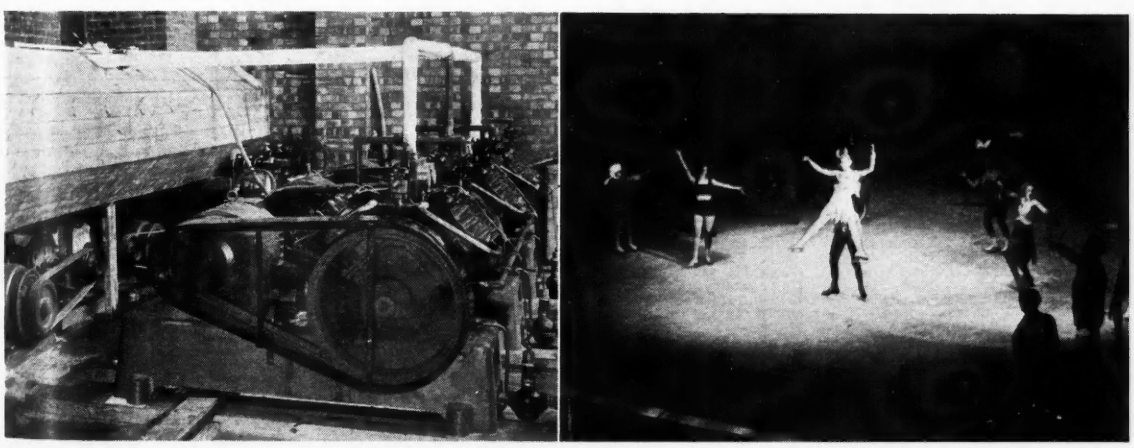
Belfast Electricity Committee invites offers for the purchase of sub-station plant.

Surrey County Council has for sale generating plant at High Ashurst, near Dorking.

(See our classified advertisements.)

French Electrical Imports and Exports

A satisfactory development is shown in imports and exports of electrical apparatus and equipment for the first six months of 1937, according to figures published by the French Treasury Department. Total imports are given as 5,733 tons, against 4,071 tons in the corresponding period of last year. In value, this is an increase from 105,501,000 fr. to 183,170,000 fr. Exports increased from 7,584 tons (84,427,000 fr.) to 9,536 tons (118,160,000 fr.). The improvement is general and not due to any one particular branch, there being only four items of imports and three of exports which show a decrease. Among the increases in imports the most notable was in apparatus, which rose from 1,791.6 tons (52,894,000 fr.) to 2,694.3 tons (89,673,000 fr.). Also important are the increases in incandescent lamp imports (from 166.2 tons and 16,959,000 fr. to 394.6 tons and 38,224,000 fr.); spare parts for batteries and condensers (from 32 cwt. and 16,000 fr. to 194 cwt. and 129,000 fr.); and dynamos and transformers (from 712.1 tons and 12,570,000 fr. to 1,079.4 tons and 23,043,000 fr.). On the export side, apparatus shipments fell from 1,869.1 tons to 1,398.7 tons, but increased in value from 34,147,000 fr. to 41,268,000 fr. The most important increases were in carbons for arcs (from 783.1 tons and 2,801,000 fr. to 1,038.9 tons and 4,306,000 fr.); carbon for brushes and carbon brushes (from



The "Prestcold" ice-making plant, and (right) a scene during the rehearsal of the ice ballet at Covent Garden [*Elec. Rev. photos.*

89 tons and 3,563,000 fr. to 351.1 tons and 5,754,000 fr.); and electric wires and cables (from 1,960.3 tons and 12,115,000 fr. to 3,482.2 tons and 19,903,000 fr.).

New Catalogues and Lists

New Welbeck, Ltd., 93, Baker Street, London, W.1.—A leaflet dealing with a new cylinder-type vacuum cleaner.

W. H. Sugdeu & Co., Ltd., Glenny Road, Barking.—A stock list of reconditioned electric motors.

Ellison Insulations, Ltd., Perry Barr, Birmingham, 20.—A revised booklet entitled "Hints on Machining Tufnol."

Sun Electrical Co., Ltd., 118, Charing Cross Road, London, W.C.2.—A complete 68-page illustrated catalogue of electric fires, convector heaters and thermostats.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham, 1.—A Christmas gifts folder to be distributed shortly.

Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2.—A leaflet concerning a new metal-clad rectifying valve.

Wilcox & Pitman, Ltd., Paragon Works, Henrietta Street, Birmingham, 19.—A folder illustrating a selection of modern lighting fittings.

Cuthbert Andrews, 47, Red Lion Street, London, W.C.1.—A booklet describing the "Protexray Tube."

M.K. Electric, Ltd., Wakefield Street, Edmonton, London, N.18.—A complete 131-page catalogue of electrical installation accessories, fully illustrated and containing many new lines.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.—A copy of "Concerning Callender's" describing and illustrating a number of Callender installations.

Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, London, E.C.1.—Catalogue No. 741 (p. 52) covering a comprehensive range of table and floor standards.

London Aluminium Co., Ltd., Witton, Birmingham, 6.—Details of a combined heating and cooking unit.

Tecalamit, Ltd., Great West Road, Brentford.—Details of new "Flex-tip" valves for air and water services.

Davis Bros., Ltd., 22, Buckingham Street, London, W.C.2.—A 24-page illustrated catalogue of trough reflectors.

Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.—Sheet No. 49/50 describing multi-range current transformers.

Allen West & Co., Ltd., Brighton.—Details of the flameproof type "SCI" direct switching starter, which has just obtained the Buxton certificate.

Samuel Hodge & Sons, Ltd., Victor Engineering Works, New Road, Rainham, Essex.—A well-bound and illustrated booklet dealing with the reconditioning of machine tools.

J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham, 11.—An 80-page illustrated catalogue of "Telaccessories" and a booklet dealing with slow-break switches for a.c. circuits.

Brown Brothers, Ltd., Great Eastern Street, London, E.C.2.—Catalogues of radio receivers and components.

Durex Abrasives, Ltd., Arden Road, Adderley Park, Birmingham, 8.—A leaflet dealing with electro-coated sandpapers.

Marconi's Wireless Telegraph Co., Ltd., Electra House, Victoria Embankment, London, W.C.2.—Details of a medium-wave receiver type Rg35 for naval and aerodrome services.

Bankruptcy Proceedings

V. M. Emerson (Emco Radio and Electrical Co.), radio dealer, &c., 35, Holloway Head, lately carrying on business at 59, Stratford Road, 166, Belgrave Road, and 332, Gooch Street, all in Birmingham.—First meeting October 29th at 159, Great Charles Street, Birmingham. Public examination November 17th at the Court House, Birmingham.

W. Gallagher, trading as Driver Brothers, 14, Ivegate, Yeadon, radio, electrical and cycle dealer. The public examination took place at the County Court House, Leeds, recently, when it was reported that the gross liabilities were £3,328, of which £2,341 was expected to rank for dividend. The deficiency amounted to £1,452. The examination was adjourned.

R. Hermann, radio engineer and salesman, "Kinnoull," Havant Road, East Cosham, lately trading as a wireless dealer and engineer at Southsea and Portsmouth.—Trustee, Mr. A. L. Medcalf, 87, High Street, Portsmouth, Official Receiver, released October 8th.

M. Morris, radio dealer, 167, Lower Clapton Road, Clapton, and lately trading at 20 and 22, High Street, and 1 and 3, Voltaire Road, Clapham, London.—Receiving order made October 20th on a creditor's petition. First meeting November 2nd and public examination December 17th, both at Carey Street, W.C.2.

W. R. Mew, wireless and electrical engineer, "Silvermere," Lushington Hill, Wooton, I. of W., formerly carrying on business at Bembridge and St. Helens, I. of W.—Last day for receiving proofs for dividend, November 2nd. Trustee, Mr. A. L. Medcalf, 87, High Street, Portsmouth, Official Receiver.

E. M. Swift, electrical engineer, 10, Joinings Bank, Langley Green, Worcester.—Last day for receiving proofs for dividend, November 2nd. Trustee, Mr. R. K. Clark, 159, Great Charles Street, Birmingham, Official Receiver.

T. Mehew, electrical engineer and contractor, Victoria Road, Netherfield, Notts.—Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham, Official Receiver, released October 8th.

S. E. Staines, deceased (S. Staines & Son), electrical engineer, 480, High Road, Leyton.—Last day for receiving proofs for dividend, November 8th. Trustee, Mr. C. B. Park, Carey Street, W.C.2, Official Receiver.

R. J. Horton, electrical engineer, 204, Coldharbour Lane, Brixton, London.—Receiving order made October 18th on debtor's own petition. First meeting November 1st and public examination December 16th, both at Carey Street, W.C.2.

G. E. Hewett, radio dealer and electrical engineer, 107, Kenton Road, Harrow.—Application for discharge to be heard on November 11th at Bankruptcy Buildings, Carey Street, W.C.2.

S. Patterson, electrician, 55, Aberdeen Walk, Scarborough.—Application for discharge to be heard on December 14th at the Court House, Scarborough.

W. Sims, electrical engineer, 16, St. James' Terrace, Buxton.—Trustee, Mr. P. M. Milward, Byrom Street, Manchester, 3, Official Receiver, released October 11th.

N. R. Neale, radio dealer, 22, Hewlett Road, Cheltenham.—Receiving order made October 18th on debtor's own petition.

United States Electrical Exports

Recovery well maintained during half-year

THE foreign trade returns of the United States for the first half of 1937 recently issued in Washington, show that recovery in electrical exports has continued. The total value was $55,125,000, an increase of $11,655,000 compared with the corresponding period of 1936. In these returns destinations are not given; the annual volume must be awaited before details of the leading American markets for electrical goods are made available.

From the following statement it will be seen that the recovery was spread over almost every important line and was particularly noticeable in domestic appliances and radio material. An advance of nearly 50 per cent. in exports of rubber insulated copper wire is also noteworthy.

	Six months ending June, 1937. $ (000).	Inc. or dec. compared with first half of 1936. $ (000).
Generators, d.c.	358	+ 212
Generators, a.c.—		
Under 2,000 kVA	151	+ 36
2,000 kVA and over	40	— 47
Steam turbine generator sets	25	— 82
Accessories and parts for generators	218	— 172
Arc welding sets	524	+ 156
Self-contained lighting outfits	710	+ 470
Batteries, 6 and 12 V storage	893	+ 333
Other storage batteries	466	+ 206
No. 6 dry-cell batteries	119	+ 119
Flashlight batteries	1,466	+ 416
Radio B. and C. batteries (dry)	290	+ 50
Other primary batteries	86	+ 16
Power transformers, over 500 kVA	246	— 4
Distribution transformers, 500 kVA and less	288	+ 108
Instrument transformers	55	— 41
Other transformers	186	+ 40
Complete battery chargers, non-rotating	125	+ 69
Double-current and motor generators, dynamotors, synchronous and other convertors	291	+ 21
Switchboard panels, except telephone	235	+ 75
Power switches and circuit breakers over 10 amp.	583	— 27
Fuses	93	+ 27
Watt-hour and other meters	387	+ 162
Electrical indicating instruments	367	+ 129
Electrical recording instruments	180	+ 73
Other electrical testing apparatus	560	+ 90
Lightning arrestors, choke coils, reactors and parts	286	+ 48
Motors, ¼ h.p. and under	373	+ 73
Motors over ¼ h.p. and under 1 h.p.	168	+ 63
Stationary motors, 1–200 h.p.	792	+ 107
Stationary motors, over 200 h.p.	77	— 3
Railway motors	235	+ 221
Electric locomotives, railway	43	+ 43
Electric locomotives, mining and industrial	235	+ 17
Station and warehouse electric motor trucks	71	— 4
Starting and controlling equipment for industrial motors	580	+ 50
Ditto, for elec. railway and vehicle motors	161	+ 44
Portable electric tools	586	+ 136
Accessories and parts for motors	860	+ 60
Refrigerators, household	7,445	+ 1,109
Refrigerators, commercial, up to 1 ton	1,632	+ 521
Parts for electric refrigerators	2,998	+ 90
Flashlight cases	490	+ 174
Electric fans	342	+ 49
Lamps for automobiles, flashlights and Christmas trees	229	+ 52
Other metal-filament lamps	537	+ 142
Other electric lamps	9	— 71
Searchlight and airport beacons	34	+ 24
Floodlights	64	— 48
Household washing machines	890	+ 444
Household washing machine parts	60	+ 34
Domestic vacuum cleaners	268	+ 11
Domestic vacuum cleaner parts	156	+ 16
Other domestic motor-driven devices except tools	384	+ 84
Electric flat-irons	157	+ 49
Electric cooking ranges	167	— 9
Domestic electric heaters and ovens	75	— 185
Other domestic electric utensils	242	*
Industrial electric furnaces, ovens and other heating devices	370	+ 90
X-ray tubes	135	+ 170
Other X-ray apparatus and parts	643	
Other therapeutic apparatus	161	
Radio transmitting sets, tubes and parts	1,130	+ 230
Receiving sets	7,650	+ 775
Receiving tubes	2,174	+ 514
Receiving set components	3,557	+ 1,122
Loud speakers	471	+ 185
Other receiving set accessories	560	+ 316
Telegraph apparatus	213	+ 102
Telephone instruments	133	+ 33
Other telephone equipment	1,517	+ 574
Bells, buzzers, etc.	113	+ 19
Starting, lighting and ignition equipment	726	+ 36
Insulating material	198	+ 21
Metal conduit, outlet, and switch boxes	558	+ 288
Sockets, fuse blocks and lighting switches	548	+ 198
Interior lighting fixtures	505	+ 45
Exterior lighting fixtures	83	— 2
Other wiring supplies and line material	442	+ 112
Electric razors	36	*
Other electrical apparatus, unspecified	3,611	+ 861
Insulated iron or steel wire and cable	95	+ 82
Rubber insulated copper wire and cable	1,015	+ 465
Weatherproof wire	219	+ 119
Telephone cable	40	+ 13
Other insulated copper wire	696	+ 230

* Comparative figures not available.

Electricity Supply

Lighting, Domestic, Power

Accrington.—ELECTRIC STREET LIGHTING.—All the streets are to be electrically lighted as a result of the Council's approval of a scheme for converting the lighting of side streets from gas to electricity.

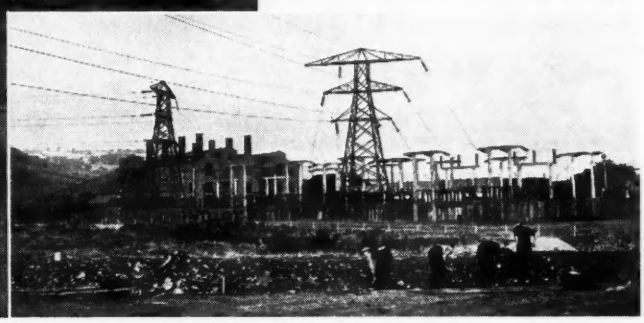
Alton.—STREET LIGHTING.—The Urban District Council is considering changing over from gas to electric street lighting.

Blackpool.—SUB-STATION.—It is proposed to erect a sub-station at Poulton-le-Fylde.

Bolton.—OVERHEAD LINE.—Applications for a supply of electricity have been received from prospective consumers in the Middle Hulton district, and a scheme has been approved.

Bournemouth.—LIGHTING.—The Corporation has obtained sanction to borrow £12,000 for public lighting.

Bradford.—ELECTRICAL EQUIPMENT.—The Finance and General Purposes Committee has approved a revised scheme of the Electricity Committee for expenditure totalling £703,790 on additional switchhouses, switchgear, boilers, coal and ash handling plant, chimney, &c., at the Valley Road power station.



An aerial view of the Treforest Trading Estate to which we referred last week (p. 580) and (right) the Upper Boat power station (South Wales E.P. Co.) which is being extended to supply electricity and steam in bulk to the estate

Brighton.—BULK SUPPLY.—The Electricity Committee has agreed to afford the Electric Supply Corporation, Ltd., a bulk supply at Pyecombe.

SUB-STATION.—The Committee is negotiating for a sub-station site in the vicinity of Cheapside.

LOANS.—Sanction is being sought to a loan of £1,450 for standard and sub-standard instruments, £20,000 for sub-station equipment and £100,000 for mains and services.

COUNCIL HOUSE ELECTRICAL EQUIPMENT.—Electric radiators costing 10s. each are to be supplied to tenants of the houses in Whitehawk Road and Harvey Road. In response to requests from tenants of houses on the Tarner estate an additional power point is to be installed in each house.

Cardiff.—ELECTRICAL DEVELOPMENT.—A scheme of electrical development in Cardiff which will possibly involve the building of a new generating station has been prepared by the city electrical engineer (Mr. E. Jones) and will shortly be placed before the City Council. The scheme would cost about two million pounds.

LOAN.—The Electricity Committee is seeking sanction to borrow £10,000 for sub-stations.

Carlisle.—SUB-STATION.—Sanction has been received by the City Council to borrow £7,000 for electricity sub-stations and equipment.

Cheltenham.—LOWER CHARGES.—The Electricity Committee recommends that the flat rate for lighting shall be reduced from 4¾d. to 4½d. per kWh; the flat rate for prepayment meter supplies from 5½d. to 5¼d.; the guarantee rate for large premises from 3¾d. to 3½d. per kWh.; and the special charge for supply to cinemas and theatres from 2½d. to 2¼d. per kWh, with the option of a two-rate tariff by contract.

LIGHTING IMPROVEMENTS.—The lighting in various roads is to be improved at a cost of £674.

EXTENSIONS.—A supply is to be given to Walker Crossweller & Co., Ltd., and the Spirax Manufacturing Co., Ltd., for factories being erected on the Whaddon estate, subject to the companies paying half the cost of the necessary transformer and making an annual payment in respect of the transformer losses. A supply is also to be given to the Birmingham Corporation for its pump house near Salterley Grange, involving the erection of a short overhead extension.

Chester.—HIGHER CHARGES.—The Electricity Committee has increased its charges by approximately 10 per cent. owing to expenditure on materials, fuel, wages and rates having risen during the year by approximately £16,000.

Clitheroe.—MAINS.—Loan sanction for £340 has been received in connection with overhead and underground mains required for supplying electricity to Sawley.

Dailly (Ayrshire).—REQUEST FOR ELECTRICITY.—The Ayr County Council is to be asked to provide an electricity supply in the village. A housing estate has already been wired.

Eccles.—HIRE OF APPLIANCES.—The minimum period condition in the agreement for the hire of domestic appliances is to be altered so that in cases where a hirer leaves the borough before the expiration of two years, or removes to other premises within the borough and takes on hire a similar appliance at his new address, he shall only be held responsible for the hire rental up to the date of vacating the original premises.

"ALL-IN" SHOP TARIFF.—A petition has been received from fifty-four shopkeepers for an "all-in" tariff applicable to shops. The electrical engineer is to report on the matter.

Falkirk.—SUB-STATION.—The Summerford Iron Co. is to take a supply of approximately 100 h.p., and this will necessitate the building of a new sub-station, together with a small extension of the extra-high-voltage system and installation of a transformer at a total cost of £750.

Hamilton.—PRICE REDUCTIONS.—The Electricity Department announces that the ordinary meter rents at present in force are to be withdrawn as from November 15th. From January 1st the basis of the fixed charge components of the two-part tariffs for residential premises is to be changed from assessed rental in the case of the domestic tariff and wattage of lamps in the case of the contract tariff to the following in both cases:—For the first apartment, 16s. per annum, and for each additional apartment, 10s. per annum, to be paid in four equal amounts per annum in the case of ordinary meters, and weekly to the nearest penny per week in the case of prepayment meters, subject to a minimum assessment of two apartments, except in the case of hostel property.

Iceland.—HYDRO-ELECTRIC PLANT.—A new hydro-electric station has just been brought into operation, the power of the Sag River being utilised for the operation of two sets of 6,000 h.p. The power is transmitted by overhead line to sub-stations in Reykjavik, a distance of 31 miles. A further set of 6,000 h.p. can be installed.

Lancashire.—ENCOURAGING THE USE OF ELECTRIC FIRES.—The Lancashire Electric Power Co. has decided temporarily to reduce by half the first deposit made by customers purchasing fires on the instalment system.

London.—MARKET LIGHTING.—The City of London Markets Committee is to proceed with the installation of a new system of electric lighting beneath the verandah surrounding the east and west sections of the Central Meat Market, and around the poultry market, at a cost not to exceed £350.

SOUTHWARK.—Sanction to borrow £10,000 in respect of mains and services is being sought by the Electricity Committee. Authorisation has been given by the Committee for the installation of "free" wiring in various premises in the area of supply, the estimated cost of which amounts to £1,800.

HACKNEY.—In connection with the extension of the generating station it is proposed to accept the tender of Concrete Piling, Ltd., at £18,310, for the construction of a ferro-concrete cooling tower capable of dealing with 1,500,000 gal. of water per hr.

On June 23rd last the Council approved an estimate of expenditure amounting to £5,000 in respect of the installation of vertical distributors on private property. Owing to rapid

developments in this class of work during the last few months, however, the borough electrical engineer reports that a further £10,000 is required.

Hammersmith.—Having considered a report on the heating of the proposed new town hall the Town Hall Committee has decided in favour of an electrical system similar to that installed in the new University of London building, Bloomsbury. To provide an electricity supply to the town hall it will be necessary to divert an extra-high-voltage cable into a sub-station to be built on the premises. The total cost of affording the supply is estimated at £4,001. Tenders for the erection of the town hall were submitted to the Council on Wednesday.

It is not proposed to take any action with regard to a communication received from the Committee of Smaller Municipal Electricity Supply Undertakings on the subject of electricity distribution.

Stoke Newington.—The Council is recommended to support the representations of the Committee of Smaller Municipal Electricity Supply Undertakings.

In accordance with a recommendation of the Town Hall Sub-Committee the borough electrical engineer is to assume responsibility for the maintenance of the electrical installation and apparatus at the new municipal buildings (town hall and public assembly hall), and a full-time electrician is to be appointed.

Manchester.—Sub-stations.—The Electricity Committee has obtained sanction to borrow £50,000 for sub-station equipment.

Middlesbrough.—Sub-stations.—Sub-stations are to be erected by the Town Council in Croft Avenue and St. Mary's Walk.

New Zealand.—Rural Extensions.—A recent conference of the Farmers' Union, North Canterbury district, passed a resolution urging that the extension of electricity supply lines to sparsely populated areas should be subsidised by the Government.

Increased Supplies to Undertakings.—There was an increase of approximately 12 per cent. during 1936-37 in energy supplied from the main Government sub-stations to distributing authorities, the total for the period being 717.4 million kWh.

North Wales.—Amended Scheme.—The North Wales and South Cheshire Local Authorities Electrical Undertakings' Association has decided to amend its proposal for the setting up of a joint electricity authority and it has now been decided to draft proposals for a joint authority based on public ownership and control, such authority to have statutory powers to acquire and control all authorised undertakings in the North Wales and South Cheshire area. This authority would therefore control generation, transmission and distribution.

Norton.—Wiring Houses for Electricity.—Tenders are to be obtained by the Rural District Council for the wiring of fifty houses in course of construction at Sherburn and Willerby.

Norway.—Insufficient Plant Capacity.—Owing to the increased consumption of power in Oslo and the Ostland region the large water-power station, Norekraft, was overloaded recently. The feeder line to Oslo was switched off, and for some time the capital was partly in darkness. The incident has revived demands for new water-power sources for Oslo or adequate expansion of the Norekraft plant. Moreover, the Oslo Press criticises the fact that the town was subjected to inconvenience due to the Norekraft load being raised to maximum value by industrial consumers who officially buy off-peak power at cheap rates. It is demanded that the distribution of power should be rationed, so far as off-peak consumers are concerned, until new sources have been provided to ensure for Oslo the amount of power which it requires and for which it pays about 1.8 million kroner annually.

Perth.—Air Ministry and Overhead Lines.—Air Ministry restrictions which were alleged to be holding up the extension of electricity supplies in the Perth district were criticised at a recent meeting of the County Council. The convener said he was told that the Air Ministry would not allow overhead lines to be erected at a certain point and the cost of laying the cables underground made the scheme prohibitive. The Lord Provost of Perth said that the Town Council had not been in any way to blame. It had been faced with the same difficulty and in the construction of the aerodrome had had to pay the extra cost of laying cable underground. It had tried to press its claim that the Government, where a Department insisted on such restrictions, should pay the difference in cost. The County Council decided that representations should be made through the M.P. for the division.

Poland.—Electricity Supply Progress.—The Société Générale d'Exploitations Electriques de Lodz et Extensions reports that the output of the power stations during last year amounted to 150 million kWh, as compared with 135.2 million kWh in 1935. The number of consumers increased from 108,392 to 115,667. The capacity of the generating plant totals 70,750 kW.

Rumania.—Electrical Development.—The Government is reported to be considering plans for a large extension of the electricity supply facilities in the country, including the construction of ten power stations.

Salford.—Cable-laying.—It is proposed to lay new cables in connection with the provision of a supply of electricity to the tuberculosis block, kitchen block and new cubicle block at the Ladywell Sanatorium and Isolation Hospital.

Southend.—Illumination "Scenes."—On the ground that visitors to see the illuminations are causing considerable annoyance to the residents of the town the Council has decided not to vote further sums for illuminations until means are found of combating the nuisance.

Stockton-on-Tees.—Sub-station.—Sanction has been received by the Town Council to borrow £1,350 in connection with equipment for the Brougham Street sub-station.

Stoke-on-Trent.—Supply Improvements.—The Electricity Committee is to improve the supply at Eaton Street, Hanley, at a cost of £600, and is to lay an additional low-voltage main in Snow Hill and Broad Street, Shelton, at a cost of £550.

Warrington.—Reduced Charges.—The Electricity Committee proposes to make concessions in the lighting tariff amounting to £6,000 per annum. Large power consumers will also benefit to the extent of £10,575 per annum.

Winchelsea.—Public Lighting.—The Hastings Electricity Department has received instructions from the Icklesham Parish Council to install public lighting in Winchelsea. For many years this borough has been without public lighting, previous to which oil lamps were used. The Department has also received instructions from the Catsfield Parish Council to increase the number of lamps in the village from four to nine.

Wirral.—Objections to Overhead Transmission.—In connection with the proposed erection of overhead lines across the peninsula, a conference was held at Bebington recently, when local authorities discussed their objections with a representative of the C.E.B. It is intended to erect a 132,000-V overhead line from Runcorn to Birkenhead to augment the supply of electricity in the Hoylake and Birkenhead areas. It is understood the scheme of overhead lines will most likely be modified to meet the views of objectors.

Wolverhampton.—Supply Improvements.—The Electricity Committee is to arrange for an increased electricity supply to the Crane Foundry Co., Ltd., at a cost of £357. Mains are to be extended to the Moreton estate, Oxley (£873).

Wrexham.—Revised Charges.—The following revised charges have been approved by the Town Council to take effect as from October 1st:—As an alternative to the flat rate for lighting shops and other business premises using over 250 kWh during each summer quarter and over 500 kWh during each winter quarter, a fixed rental of 2s. 6d. per summer quarter and 6s. per winter quarter in respect of each 100-W installed, plus 1d. per kWh, with a discount of 5 per cent. for prompt payment; supplies through slot meters, 4½d. per kWh; off peak water heating up to 100 kWh per quarter ½d. per kWh, and all in excess, ¼d. per kWh; public street lighting, ½d. per kWh.

Traction

London.—More Trolley-buses.—Leyland Motors, Ltd., have received a contract for the supply of 200 trolley-bus chassis and bodies to the London Passenger Transport Board.

Diversion of Tram Subway.—In preparation for the construction of the new Waterloo bridge work has been proceeding for some months on the difficult task of re-aligning a short part of the tram subway leading from the Victoria Enbankment to Kingsway. This alteration was necessary in order to bring the tunnel entrance centrally between the twin supporting members of the Embankment span of the new bridge. The work is now approaching completion and the trams were, in fact, diverted to the new portion of the subway last month.

Increased Accommodation of "Tube" Trains.—The London Passenger Transport Board is shortly to operate an experimental service of longer trains on the Northern line, states the *Daily Telegraph*. Tests are being made to ensure that the signalling arrangements are not interfered with.

Portsmouth.—Trolley-bus Overhead Equipment.—The Transport Committee is to renew trolley-wire on the trolley-bus system at an estimated cost of £2,000.

Russia.—Trolley-buses in Moscow.—According to the *Passenger Transport Journal*, at the end of this year 157 new trolley-buses will have been put into operation in Moscow. At present there are 232 trolley-buses, which carry an average of 240,000 passengers daily. By the end of next year 1,000 trolley-buses will be running on the Moscow streets, including fifty-two double-deck vehicles.

Wolverhampton.—Trolley-buses.—The Transport Committee is to purchase twelve double-deck trolley-vehicles at an estimated cost of £28,000.

Communications

Alaska.—Radio-telephone Communication.—A radio-telephone system has recently been established between Juneau, Alaska, and Seattle, U.S.A., a distance of 895 miles.

Finland.—Telephony.—The Post Office reports that the aggregate length of telephone lines was 115,452 km. at the end of 1936. During the current year a further 14,200 km. of trunk lines is being added to the network. Some of the more important works in hand include new lines between

Helsinki and six of the larger provincial cities. It has further been decided to provide a new telephone cable between Helsinki and Stockholm; work on this will be commenced next year.

Great Britain.—L.N.E.R. TELEPRINTER APPARATUS.—The London and North-Eastern Railway Co. has decided to install further teleprinter circuits with a view to increasing the efficiency of communications between the various districts. An interesting feature of the new installations is that they will be connected with an automatic switchboard to be installed at the telegraph office at Liverpool Street Station, and direct contact will be established between any two points by operating the automatic dial, which is in all respects similar to the telephone dialling system. This will enable a large number of cross-country circuits to be connected up, when required, almost instantaneously. A further unique advantage of this system is that in the case of any telegraph office being closed telegrams can be dispatched to that office by means of the teleprinter as the instrument at the receiving end functions automatically.

NEW B.B.C. REGIONAL HEADQUARTERS.—The British Broadcasting Corporation has acquired a two-year option to build new Midland Regional headquarters on a 6,000-sq. yd. site in Birmingham.

AIRPORT RADIO STATION.—The radio station at the Longman airport is now ready for use and is shortly to be placed in operation. During the past few weeks experiments have been conducted in conjunction with Highland Airways pilots flying between Inverness and Orkney, and these tests have proved very successful.

AUTOMATIC TELEPHONY.—On Monday a new automatic telephone exchange with accommodation for 5,200 lines was put into service at Grimsby.

Irish Free State.—SHORT-WAVE RADIO STATION.—Tests will shortly be made at Radio Athlone with a view to establishing a short-wave station in the Irish Free State. The Department of Posts and Telegraphs has already invited tenders for the erection of a 5-kW transmitter. The site of the station has not yet been chosen, but may be in the neighbourhood of Moydrum, near Athlone.

Norway.—NEW AUTOMATIC EQUIPMENT.—The Post Office has placed a contract valued at one million kroner with Standard Electrics Kabel og Gummifabrikk for the supply of components for automatic exchanges. A contract for automatic exchange equipment to the value of 1½ million kroner has been placed by the private telephone company of Stavanger with Elektrisk Bureau. The latter concern has further booked an order for automatic equipment to be delivered to the Halden telephone company. The Post Office is to spend two million kroner on the extension of the network of municipal exchanges in Oslo. It is further proposed to extend the telephone trunk cable, Oslo-Kornsjo, beyond the latter town to Halden.

RECORD INCOME.—Accounts for the financial year 1936-37 published by the Telegraph Department of the Post Office show an income of nearly 38½ million kroner, the highest on record. In the previous year the income was 34 million kroner. The net profit exceeded seven million kroner, or 1.7 million kroner more than was estimated.

INCREASE IN RADIOGRAMS.—The number of radiograms handled by the Bergen station during the financial year 1936-37 shows a very substantial increase as compared with the preceding year (86,683, against 64,559). Post Office returns of income on messages *via* the Bergen station show an increase by nearly 40 per cent.

Sweden.—TELEPHONES INCREASE.—A substantial increase in the number of telephone subscribers is reported by the Post Office. The number of subscribers at the end of 1936 was 672,425, or over 10 per cent. of the population. The improvement of 44,317 during the year was better than in any previous twelve months. In Stockholm there are 348 telephone subscribers per thousand inhabitants. During the year under review fifty-five new automatic exchanges were opened.

Police Radio Communication

CONTINUOUS patrolling of London by police cars under radio direction from New Scotland Yard has been maintained since 1934. The original transmitting station, adjoining the Yard, suffered from electrical interference and the lack of an efficient aerial system and so a new transmitting station was constructed near West Wickham complementary to the receiving station opened last year at Denmark Hill. Both stations are remote-controlled from New Scotland Yard, without any relaying, *via* a four-channel v.f. telegraph unit supplied by Standard Telephones and Cables, Ltd., or in emergency by separate lines on the Simplex system. Transmission frequency is 2,060 k.c. (145 metres).

The West Wickham station is a rectangular building 250 ft. long and the transmitting hall at its west end measures 60 ft. by 30 ft. by 15 ft. high. One of the two transmitters is of the Marconi "SWB-8" 1.5-kW type, with three cubicles. The first cubicle contains Westinghouse rectifiers for grid bias supplies to all stages and l.t. and h.t. to the drive and low-power amplifying stages; the second contains the h.t. supply and the high-power and final stages of the transmitter, three-phase full-wave rectification being employed with mercury-vapour rectifying valves; the third cubicle houses the transmitter proper. Frequency is controlled by a Franklin (master oscillator) drive circuit; the low-power drive is amplified through several stages and feeds the first amplifier—a single valve with a balanced circuit designed to energise the pair of push-pull air-cooled valves in the output stage.

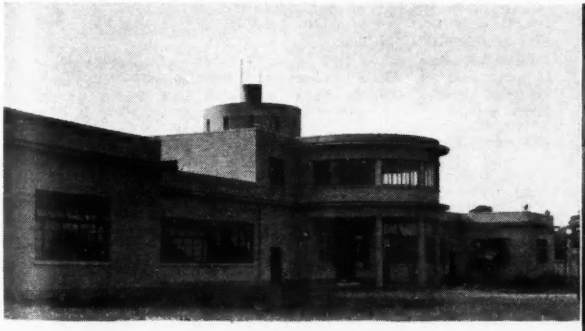
The second transmitter (1 kW), which has been built by the engineering staff, is in three units—transmitter, control switchboard and rectifier cage. The h.t. supply to the final stages is by mercury-vapour rectifiers, while Westinghouse metal rectifiers supply the grid bias to all stages and h.t. to the drive unit. Frequency is controlled by a low-power master oscillator. Output is amplified through several stages of small gain and passed to the first and final amplifiers and so to the aerial. Both transmitters are coupled to separate aerials through a 600-ohm line. Land lines, transmitting relays, monitory equipment and connections and the local operation of transmitters are brought together on a control table.

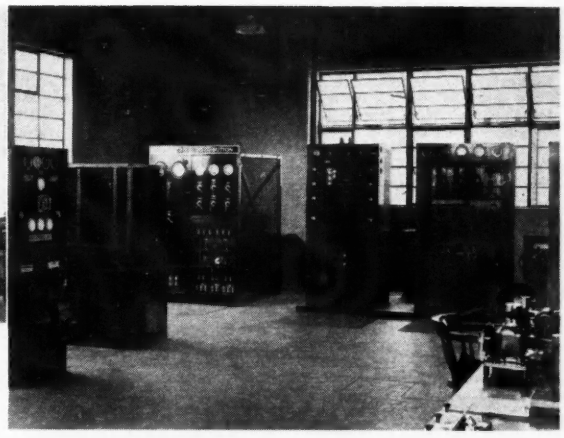
The main aerial is supported by two 100-ft. steel towers 300 ft. apart and no metal is used in the pole equipment. Insulators are of Pyrex glass. The aerial for No. 2 transmitter is taken to a temporary 80-ft. sectional steel mast.

As a public supply is not available, three Diesel generating sets have been installed. One of these consists of a 500-r.p.m. three-cylinder engine by W. H. Allen & Sons direct-coupled to a 75-kW 400-V three-phase alternator by the Lancashire Dynamo Co. The others are Tangye-Ricardo 1,000-r.p.m. five-cylinder engines driving 25-kW Crompton Parkinson alternators. All machines can be paralleled at a four-panel Crompton Parkinson machine switchboard, and the feeder switchboard is fitted with M.E.M. and Kartret fuses. An overhead travelling crane by Brown & Aitken has been provided.

In the test room are a cathode-ray equipment by A. C. Cossor, Ltd., ripple meters and signal generator by Marconi-Ekco, Ltd., and laboratory apparatus by Sullivan, Muirhead and Tinsley. The remainder of the ground floor is taken up by workshops and stores and a covered garage where cars and vans can be fitted.

The area served by the station covers nearly 1,000 sq. miles. Twelve vans and three cars are equipped for both transmission and reception and 200 cars for reception only.





[Elec. Rev. photos.

The new police wireless station at West Wickham. The right-hand picture shows the transmitter hall

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Audenshaw.—November 4th. U.D.C. Electrical installations at twenty-four houses to be erected on the Wellington Street estate. J. Eaton & Sons, architects, Stamford Street, Ashton-under-Lyne.

Bedford.—November 15th. Borough Council. Twelve months' supply of meters, cookers and cooker control units, kettles, meter boards and fuses. (See this issue.)

Birkenhead.—November 15th. Corporation. Twelve months' supply of cable, meters and transformer kiosks. (See this issue.)

Braintree.—November 10th. R.D.C. Three vertical-spindle automatically controlled crude sewage pumps, with electric motors, at the White Notley sewage pumping station, and two sets at the Cressing station, with all accessories. Financial Officer, Council Offices, St. Peter's Close, Bocking, Essex (deposit £3 3s.).

Camborne-Redruth.—November 4th. U.D.C. Electrically driven crushing plant. Surveyor, Station Hill, Redruth.

Cleethorpes.—November 15th. Corporation. Three double-deck trolley-buses, with accommodation for fifty-six passengers each. Engineer and manager, Corporation Transport Offices, Pelham Road.

Coventry.—Airport Committee. Lighting at the airport, Baginton, including equipment, switchgear and cables. (See this issue.)

Edinburgh.—November 18th. Burgh Council. Coal handling plant for the Portobello generating station. (October 22nd.)

Erith.—November 16th. R.D.C. Electricity Department. One 4-panel and one 5-panel switchboards. (See this issue.)

Exeter.—November 10th. City Council. Overhead cable (1,075 yd. in length) from Countess Wear swing bridge to Double Locks, or, alternatively, the supply and erection of electrical plant at Double Locks Hotel. R. H. Dymond, city engineer, Municipal Offices.

Farnworth.—November 8th. U.D.C. Electricity Department. Wiring cables. (See this issue.)

Fife.—November 8th. County Council. Electric lighting at forty houses at Thornton and forty at Woodside. C. R. Douglas & Son, 15, East Port, Dunfermline (deposit £1 1s.).

Gellygaer.—November 1st. Electricity Department. House service meters. (October 15th.)

Grimsby.—November 5th. Corporation. L.p. cables. (See this issue.)

Halifax.—November 11th. Corporation. Six electrically driven centrifugal pumps for the sewage works, Copley and North Dean (Con. L.4). C. Lumb, manager, Sewage Department, Salterhebble.

November 11th. Cleansing and Sewage Committee. Various works, including electrical, in connection with buildings, &c., at North Dean and Copley. D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £1 1s.).

Heston and Isleworth.—October 30th. Borough Council. Electric lighting and power installation at the proposed public swimming bath, New Heston Road, Heston. (October 22nd.)

Hornsey.—October 30th. Electricity Department. D.c. and a.c. meters and fixed charge collectors, maximum demand indicators, load controllers and time switches. (October 15th.)

Iraq.—Modern lighting equipment for the aerodrome at Rutbah, complete with the necessary cables, &c. Royal Iraq Legation, 22, Queen's Gate, London, S.W.7.

Irish Free State.—DUBLIN.—November 20th. Electricity Supply Board. 40-kV and 10-kV underground power cables, with pilot and telephone cables and jointing accessories; also cable laying. (October 15th.)

Kingston-upon-Thames.—November 15th. Corporation. Street lighting equipment. (See this issue.)

Leicester.—November 6th. City Council. One electrically driven ram pump, capable of delivering screened sewage at rates varying from five to ten million gallons per twenty-four hours against a head of 180 ft., for the Abbey pumping station, and a similar set capable of one-half to one million gallons against a head of 220 ft., for the Belgrave station. City Surveyor's Office, Town Hall (deposit £2).

Leyton.—November 10th. Corporation. E.h.v. switchgear. (See this issue.)

London.—BATTERSEA.—November 15th. Borough Council. Coal. (See this issue.)

Manchester.—November 3rd. Electricity Committee. H.p. steam and water valves and traps at the Stuart Street station; and coal-handling plants, each comprising conveyor, drag scrapers and steam jib cranes, at the Barton and Stuart Street stations. (October 22nd.)

November 10th. Six months' supply of weldless steel lamp columns and fittings. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall.

Middlesex.—November 22nd. County Council. Electrical installation at the new Technical Institute, The Burroughs, Hendon. (October 22nd.)

Newcastle-upon-Tyne.—November 8th. Transport and Electricity Committee. Cadmium trolley wire and tubular tramway poles. T. P. Easton, general manager, Transport and Electricity Undertaking, Manors (deposit £2 2s. each).

Northumberland.—County Council. Installation of electricity in the Seaton Valley Astley Central school and the Longbenton Dudley Council school. County architect, County Hall, Newcastle-upon-Tyne.

Nottinghamshire.—November 15th. County Council. Electrical work at a Mental Colony to be erected at Balderton, Newark. (See this issue.)

Plymouth.—November 15th. Corporation. Three-phase meter testing equipment. (See this issue.)

Rochdale.—November 23rd. Electricity Committee. Twelve months' supply of meters. (See this issue.)

St. Helens.—November 12th. Borough Council. Salt glazed stoneware ducts and cable protection tiles; also h.v. and l.v. p.i. cables. (See this issue.)

Salford.—November 4th. City Council. Electrical installation at the proposed new buildings at Ladywell Sanatorium, Eccles New Road. City electrical engineer, Electricity Department, Frederick Road.

Sheffield.—November 1st. Electricity Committee. Reinforced concrete and other works for the accommodation of a 50,000-kW turbo-alternator and boiler in the No. 2 station at Blackburn Meadows. (October 15th.)

Shipston-on-Stour.—October 30th. R.D.C. Electric lighting at thirty Council houses at Tysoe and six at Little Compton. E. H. Earp, 48, Henley Street, Stratford-on-Avon.

Skipton.—November 4th. R.D.C. Pumping station, with electric motor and borehole pump, and all contingent works. F. J. Rodwell & Son, engineers, 20, Park Row, Leeds (deposit £2 2s.).

South Cambridgeshire.—November 2nd. R.D.C. Duplicate electrically driven vertical centrifugal borehole pumps, of 15,000 gal. per hr. capacity, with recording equipment and accessories for the pump-house, near Wendy. Sands & Walker, Milton Chambers, Nottingham (deposit £3 3s.).

Southend-on-Sea.—December 8th. Borough Council. 250-kVA alternator, motors, switchgear and accessories, at the refuse disposal works. (October 22nd.)

November 22nd. Pumping plant at three stations, comprising nine electrically driven sewage pumps, with discharging capacities from 400 gal. to 3,500 gal. per min., motors, switchgear, piping, &c. J. D. & D. M. Watson, 3, Central Buildings, Westminster, London, S.W.1 (deposit £3 3s.).

South Kesteven.—October 30th. R.D.C. Electrically driven horizontal type centrifugal pump (60-gal. per min.). C. W. Bell, clerk, 41, North Street, Bourne, Lincs.

South Shields.—Town Council. Electrical installations in 652 houses at Horsley Hill. J. Reid, borough engineer.

Stoke-on-Trent.—November 10th. Electrical Engineer's Department. Electric tower wagon. (October 15th.) Two 15,000-kVA outdoor-type transformers. (October 22nd.)

Sutherland.—November 16th. County Council. Electrical work at thirty-two houses at Brora. E. W. Brannen, architect, Public Health Office, Dornoch.

Swansea.—November 29th. Borough Council. Meter test-room equipment comprising single-phase testing equipment, test racks, rotating sub-standard meters and stop-watches. (See this issue.)

Uruguay.—MONTEVIDEO.—December 3rd. State Electricity Supply and Telephones Administration. 131,400 metres of single-, two- and three-core l.c. conductors. (T.Y. 20716/37.)*

December 7th. Three automatic voltage regulators and accessories. (T.Y. 20717/37.)*

November 17th. Eight current transformers. (T.Y. 20718/37.)*

December 13th. Steel conduit for embedded electrical installations. (T.Y. 20715/37.)*

West Hartlepool.—November 10th. Borough Council. 300-kVA transformer. (See this issue.)

West Riding.—November 8th. County Council. Electric lighting at the extensions to Wickersley Senior Council school. Education officer, County Hall, Wakefield.

November 22nd. Standing Joint Committee. Various works, including electrical, at the proposed alterations at Barnsley court house and police station. West Riding architect, County Hall, Wakefield.

Zetland.—November 11th. County Council. Electrical work at forty houses. H. K. Macdonald, county architect, 30, Commercial Street, Lerwick.

---

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Birkenhead.—Health Committee. Accepted. X-ray equipment for the Municipal Hospital (£646).—Alexander & Fowler.

Cardiff.—Electricity Committee. Accepted. Switchgear.—Ferguson, Pailin (£687); G.E.C. (£470).

Coatbridge.—Town Council. Accepted. Electrical work at 448 houses.—J. Stuart Denholm.

Croydon.—Hospital Committee. Accepted. Equipment for the kitchen at the Mental Hospital: Twenty-one hot-cupboards (£1,069).—Revo Electric Co. Twenty-one water boilers (£571).—Jackson Boilers, Ltd. Rectifier equipment (£600).—Nevelin Electric Co.

Dundee.—Housing Committee. Accepted. Electric lighting installation at the Gardner Street housing estate (£297).—D. J. Macdonald.

Manchester.—Town Hall Committee. Accepted. Display fittings for new electricity showrooms at Town Hall extension.—W. Higgin, Ltd.

Electricity Committee. Accepted. Automatic combustion control equipment for boilers Nos. 61-64 at the Stuart Street station.—J. Gordon & Co. H.p. pipework at the Stuart Street station.—Babcock & Wilcox. L.p. pipework at the Stuart Street station.—Brightside Foundry & Engineering Co.

Preston.—Public Assistance Committee. Accepted. Installation of a new system of electrical wiring at the Institution (£5,096).—T. Dryden & Sons.

Grimsby.—Electricity Committee. Recommended. Three sub-station switchboards (£1,617).—W. Lucy & Co.

London.—SOUTHWARK.—Electricity Committee. Recommended. Testing apparatus.—Met.-Vick. Elecl. Co.; Crompton Parkinson; Siemens Bros.; Synchronome Co.

HAMMERSMITH.—Electricity Committee. Recommended. Switchgear and metering equipment in connection with a supply of electricity to a new distillery pumping house (£302).—Ferguson, Pailin.

L.C.C.—Accepted. Wiring and fittings for electric lighting, &c., in remainder of block 2 of dwellings on the Shipwright estate, Stepney (£501).—Keeble, Ltd., Wiring and fittings for electric lighting, power, telephones, fire alarms, domestic bells and call bells in the new nurses' home, &c., at St. Clement's Hospital, Poplar (£1,225).—W. Steward & Co. Wiring and fittings for headphone and loud speaker sockets at Queen Mary's Hospital, Sidcup, St. Francis' Hospital, Dulwich, and St. John's Hospital, Wandsworth (£1,033).—H. J. Cash & Co. Electric bed lift at the Hackney Institution (£1,220).—Evans Lifts. Wiring and fittings for electric lighting, power and patients' lamps and bell signalling systems, &c., at St. Mary Abbot's Hospital and Institution, Kensington (£3,141).—Duncan Watson (Electrical Engineers). Wiring and fittings for electric lighting, power, radio telephones, fire alarms, domestic bell and patients' signalling systems at Hackney Hospital and Institution (£3,177).—Read & Partners.

METROPOLITAN WATER BOARD.—Electric lift at the waterworks, Hampton (£558).—Etchells, Congdon & Muir.

ST. MARYLEBONE.—Electricity Committee. Recommended. Meters for a further twelve months.—Chamberlain & Hookham; Ferranti, Ltd.

ST. PANCRAS.—Contracts and Stores Committee. Recommended. D.c. potentiometer (£118).—Cambridge Instrument Co. Four 750-kVA transformers for sub-stations (£455 each).—Fuller Electrical & Manufacturing Co. Meters.—Chamberlain & Hookham. Forty-two horizontal electric-discharge lanterns in Kentish Town Road (£5 5s. each).—B.T.H.

STOKE NEWINGTON.—General Purposes Committee. Recommended. Electric floor cleaning equipment for use in the new Town Hall and Public Assembly Hall.—Rallnick & Gordon, Ltd.; Hoover, Ltd.

Electricity Committee. Recommended. Installation of lateral mains in the Paradise House flats.—City Electrical Co.

Middlesbrough.—Town Council. Accepted. Electric cables.—Hackbridge Cable Co.; Enfield Cable Works.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, November 4th. Institution, London, W.C.2. 6 p.m. "Street Traffic Signals, with Particular Reference to Vehicle Actuation." Mr. F. G. Tyack.

Mersey and North Wales (Liverpool) Centre.—Friday, October 29th. Reece's Red-White Ballroom, Liverpool. 8 for 8.30 p.m. Dinner-dance. Monday, November 1st. The University, Liverpool. Twenty-eighth Kelvin lecture. "The Elementary Particles of Matter." Professor J. Chadwick.

North Western Centre.—Tuesday, November 2nd. Engineers' Club, Manchester. 7.15 p.m. "Modern Factors Affecting Electricity Costs and Charges." Mr. J. A. Sumner.

Tees-side Sub-Centre.—Wednesday, November 3rd. Cleveland Technical Institute, Middlesbrough. 6.45 p.m. Address by Mr. W. D. Horsley, chairman of the North Eastern Centre.

Transmission Section. — Wednesday, November 3rd. Criterion Restaurant, London, W.1. 8 p.m. Conversazione and dance.

Wireless Section.—Wednesday, November 3rd. Institution, London, W.C.2. 6 p.m. Address by Mr. T. Wadsworth, chairman.

Meter and Instrument Section.—Friday, November 5th. Institution, London, W.C.2. 7 p.m. Address by Mr. H. Cobden-Turner, chairman.

North Eastern Centre.—Friday, November 5th. Grand Assembly Rooms, Newcastle-upon-Tyne. 8 for 8.30 p.m. Annual dance.

Faraday House Old Students' Association.—Friday, October 29th. Savoy Hotel, London, W.C.2. 6.30 for 7 p.m. Annual dinner.

Junior Institution of Engineers.—Friday, October 29th. 39, Victoria Street, London, S.W.1. 7.30 p.m. Informal meeting. "Submarine Telegraph Cables. Their Construction and Maintenance." Mr. H. G. S. Trowbridge. Friday, October 29th. College of Technology, Manchester. 2.30 p.m. Joint technical discussion on materials and their testing. Friday, November 5th. 39, Victoria Street, London. 7.30 p.m. Informal meeting. "Some Factors Governing the Choice of Industrial Drives." Mr. S. Osborne-Shave.

Association of Supervising Electrical Engineers.—Saturday, October 30th. Central Library, Tudor Place, Sheffield. 6 p.m. "Compulsory Wiring Regulations and Registration." Mr. J. Munro.

Electrical Power Engineers' Association (*London Technical Group*).—Tuesday, November 2nd. Caxton Hall, Westminster, London, S.W.1. 7.15 p.m. "Cooling Towers." Mr. T. G. Gueritte.

Institution of Civil Engineers.—Tuesday, November 2nd. Institution, London, S.W.1. 6 p.m. Opening meeting. Presidential address by Mr. S. B. Donkin.

Institution of Heating and Ventilating Engineers.—Wednesday, November 3rd. Institution of Mechnical Engineers, London, S.W.1. 7 p.m. "Electric Heating, with Special Reference to Steam Raised by Electricity for Various Purposes." Messrs. W. Gilchrist and S. A. Williams.

British Electrical and Allied Manufacturers' Association.—Thursday, November 4th. Grosvenor House, London, W.1. Annual dinner.

Notes

The Distribution Bill

The King's Speech in opening Parliament on Tuesday last stated that a measure for improving the distribution of electricity would be brought forward.

Capt. Balfour, in moving the motion for an address in the House of Commons, said that further steps in the direction of modern industrial practice were now to be applied to electricity and coal. The promise of a Bill for the better distribution of electricity meant to the House of Commons, except for a few experts, a highly technical measure. He hoped that the Bill, when it finally went on to the Statute Book, would be evolutionary rather than revolutionary in its character, and would have the effect of bringing a cheap supply of electricity to homes which had hitherto not been able to afford it, and particularly in the rural areas.

Mr. Attlee, leader of the Opposition, declared that there was a certain amount of suspicion, in connection with the electricity legislation, that it might be handing over electricity to private enterprise instead of developing it in the interests of the country.

An E.P.E.A. Dinner

About 200 members were present at last week's annual dinner-dance of the North-West Section of the Electrical Power Engineers' Association at Wolverhampton. Mr. W. J. Duffy, chairman of the section, presided. Toasting the Association, Mr. C. H. Yeaman (city electrical engineer, Stoke-on-Trent) said that a notice suspended in Stoke City Hall recommended all employés to join their trade unions. The city had 100 per cent. membership of the E.P.E.A. and the Council had always carried out its obligations in relation to wages schedules, &c. Changes were looming ahead in the industry, but he thought the value of the Association would increase and not diminish whether they got regional boards or anything else. Responding, Mr. H. J. Cox (president, E.P.E.A.) said they were doing everything in their power to enhance the prestige of the industry. Mr. Duffy proposed the health of Mr. W. E. Fry, who organised the function. Among those present were: Mr. E. Morgan (S.W. & S. Co.), Mr. C. Heathcock and Mr. W. Weygood (Midland Electric Corporation), Mr. T. A. G. Margary (Wolverhampton), Mr. A. E. Newburn (Walsall), Mr. J. Kellie (Stafford), Mr. P. Wardle (Cannock), and Mr. A. J. C. de Renzi (Newcastle-under-Lyme).

The Leeds Electrical Club

The annual dinner and dance of the Leeds Electrical Club will take place at the Victory Hotel, Briggate, Leeds, on November 17th, when Mr. C. Nelson Hefford will preside. Tickets (10s. 6d. each) may be obtained from Mr. S. T. Needham, hon. secretary, 10, York Place, Leeds.

The Birmingham Electric Club

The Birmingham Electric Club held its annual dance in the Grosvenor Suite of the Grand Hotel on October 15th. Many prominent electrical engineers and their wives were present, making a total of nearly five hundred persons. Mr. H. Hooper, of Birmingham, who presided, presented the ladies with small mementos.

Fatality

"When work of that kind is undertaken close to a live wire the current should be switched off" was the rider added by a Rixton, Warrington, jury, in returning a verdict of "Death from misadventure," at an inquest held recently on a linesman employed by the Lancashire Electric Power Co., who died following an electric shock while repairing overhead wires. The man, William Hart, was standing on a ladder leaning against a pole repairing wires, two of which were dead and three others carrying 230 V, when he either slipped or forgot, grasped a live wire with one hand and held on to a neutral wire with his other hand. He fell 30 ft. to the ground and died shortly afterwards. He was stated to be an experienced man.

Appointments Vacant

Internal audit clerk for the North-West Midlands J.E.A.

Assistant lecturer in electrical engineering at Sheffield University.

Control engineer for Croydon Electricity Department.

Three sales engineers for London Associated Electricity Undertakings, Ltd.

Chief instructor in wireless telegraphy, Hong Kong Trade School.

(See our Classified Advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of the following:—

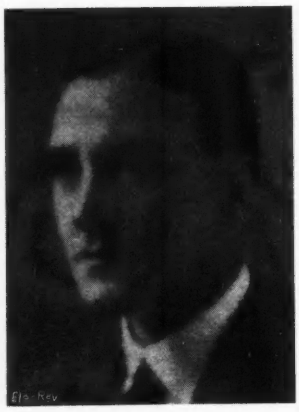
Firms undertaking the lead covering of cables.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. C. Rowbotham, engineer and manager of the Reigate Corporation electricity undertaking, has been appointed borough electrical engineer at Beckenham in succession to the late Mr. J. E. Tapper. Mr. Rowbotham was engaged as an assistant engineer under the Admiralty in 1919, dealing with the reorganisation of electricity supplies at the Auxiliary Naval Depôts attached to Portsmouth Dockyard. He was appointed chief assistant electrical engineer to the Sheffield Coal, Coke and By-Product Co. in 1923, and later became chief electrical engineer. In 1927 he was appointed district distribution engineer, and in 1934 went to Reigate as mains engineer in the Corporation Electricity Department at a time when the distribution system in the area was being reorganised. He was appointed engineer and manager of the Reigate electricity undertaking in February last year.



Mr. C. Rowbotham

A.C.E. Machinery, Ltd., announce that by arrangement with R. A. Lister & Co., Ltd., Dursley, **Mr. W. J. Gibbs** has joined their board. Mr. Gibbs has for the past seven years been on the executive staff of Lister's. He takes up his new duties forthwith.

Mr. R. W. L. Phillips, borough electrical engineer of Bedford, who has reached the retiring age, is to continue in office another year.

Mr. W. Weekes, who, as we announced in our last issue, is to retire next month, has been borough electrical engineer at Shoreditch since 1925. He received his electrical training with W. T. Goolden & Co., and in 1893 became electrical engineer in charge of traction contracts, &c., for Easton, Anderson and Goolden. Shortly afterwards he became assistant engineer in the Blackpool Corporation Tramways Department. Mr. Weekes went to Shoreditch in 1897 as shift engineer, but three years later went to South Africa with the Imperial Yeomanry. While in South Africa he assisted in the supervision of the locomotive repair shop of the Beira-Salisbury Railway. Returning to Shoreditch, he was appointed shift charge engineer at Whiston Street power station, and in 1907 he became assistant electrical engineer and mains superintendent.

Mr. P. C. Ebner has been appointed to succeed Mr. Weekes at Shoreditch, and for the time being will be designated acting borough electrical engineer. He was educated at St. George's Grammar School, Bloomsbury, and received his technical training at the Regent Street Polytechnic. Prior to entering the service of the Shoreditch Borough Council in 1903 he was with Chamberlain and Hookham, Ltd. In 1911 Mr. Ebner became assistant mains and consumers' engineer in the Shoreditch Electricity Department, and on the appointment of Mr.

Mr. W. Weekes

Mr. P. C. Ebner

Weekes as borough electrical engineer he was made first technical assistant and placed in charge of the whole distribution side of the undertaking. For many years the public lighting of the borough has been under his supervision, during which time it has been changed over entirely to electricity. Mr. Ebner is an A.M.I.E.E. and is a member of the Association of Public Lighting Engineers and of the Batti-Wallahs' Society.

Mr. A. J. Hastings has been appointed deputy borough electrical engineer at Great Yarmouth in place of Mr. S. F. Blyth, who has retired after forty years' service.

Mr. A. T. Barratt, of the Manchester Branch of the E.C.A. and the Manchester Electrical Circle, was last week elected to the Manchester City Council.

Mr. R. T. Harris, combustion engineer with the Bennis Combustion Co., Ltd., has been appointed combustion engineer with the Croydon Corporation Electricity Department at a salary of £450 per annum.

Mr. H. Vic Verrells has been appointed mouldings sales manager of E. K. Cole, Ltd.

Mr. H. A. S. Gothard, consulting engineer, is taking **Mr. R. M. Maling** and **Mr. L. H. Mackay** into partnership. His practice as from November 1st will be carried on under the style of Alexander Gothard & Partners, at Holborn Viaduct House, 12, Holborn Viaduct, E.C.1. For the convenience of Continental clients one of the partners will always be available for consultation, by appointment, at the offices of their representative, Mr. E. R. H. Plaistowe, 11 bis, Rue Volney, Paris (2).

Mr. A. C. V. Clarkson has been appointed assistant publicity manager of the General Electric Co., Ltd., as from October 1st. For the past five years Mr. Clarkson has been in charge of the company's Exhibition Department, which is responsible for all exhibition and display work.

Mr. W. Smith, deputy chief clerk in the West Ham Corporation Electricity Department, has been recommended for the appointment of chief commercial assistant with the Hammersmith Electricity Department at a salary of £500, rising to £600 per annum.

Mr. H. Oswald (formerly engineer in India for the Swiss house of Brown-Boveri, Ltd.) has recently been appointed general manager of British Brown-Boveri, Ltd. The company will continue to have the part-time services of its director, Mr. A. C. Eborall, in an advisory capacity and as the delegate in London of the board of that company.

Mr. A. P. Good (chairman) and **Mr. W. M. Ratcliffe** (managing director) of Heenan & Froude, Ltd., have joined the board of Caprotti Valve Gears.

The Croydon Council at its meeting on October 25th approved an increase in the salary of **Mr. F. N. Rendell-Baker,** M.I.E.E., chief engineer and general manager of the electricity undertaking from £2,000 to £2,200 per annum to take effect as from April 1st next, with two further annual increments of £100 up to £2,400 per annum.

Mr. G. Manning, who has been telephone manager for the Sheffield area since the introduction of area working in the district in February, 1936, has been appointed manager of the Manchester area. He is succeeded at Sheffield by **Mr. J. Magnall,** of Colchester.

Obituary

Mr. E. A. Anderson, engineer and manager of the Walton and Weybridge D.C. Electricity Department, whose death was announced in our last issue, was fifty-two years of age. Mr. Anderson commenced his career in the North of England and was for several years with the Newcastle-upon-Tyne Electric Supply Co. After war service he became engineer and manager at Amble, Northumberland. When the Walton Urban District Council took over the electricity undertaking from the Urban Electric Supply Co. in 1927 Mr. Anderson was appointed its first engineer and manager. The funeral took place on October 20th at Weybridge.

The late Mr. E. A. Anderson

Lord Rutherford.—Following upon cremation at Golder's Green on Saturday, the remains of the late Lord Rutherford, of Nelson, were buried in Westminster Abbey on Monday. Close by the resting place of the remains are the graves of Kelvin, Faraday and other historic scientists. His Majesty the King was represented, as was also the Prime Minister. Lady Rutherford was among the family mourners. The pall-bearers included Sir Wm. Bragg, President of the Royal Society; Sir Frank Smith, of the Department of Scientific and Industrial Research; and Sir George Lee, President of the I.E.E. Both at the funeral service at the Abbey and the memorial service at Trinity College Chapel, Cambridge, large

numbers of men and women of distinction were present, representing the sciences, the universities, scholastic bodies, and the electrical and various other industries.

Mr. J. K. Stothert.—The death of Mr. John Kendall Stothert, M.I.E.E., announced in our last issue, removes one more from the number of those who were actively associated with the Ferranti Generating Station at Deptford. After receiving his general education at Retford School and at Cambridge University, he entered Faraday House in 1891, and began his practical engineering experience at Deptford with the London Electric Supply Corporation. Mr. Stothert left the Corporation to take up a position with John Fowler & Co., Ltd., Leeds, where he superintended a great deal of station construction work, subsequently being associated with the building of the Liverpool Overhead Railway under the Electric Construction Co. At the beginning of 1898 he joined Babcock and Wilcox, and until his retirement some years ago he was that company's representative in Glasgow. In 1916 Mr. Stothert was the chairman of the Scottish Centre of the I.E.E., and for a time he was a director of the Clyde Valley Electric Power Co., and also of the Strathclyde Electric Supply Co.

Col. Warren R. Thompson, construction engineer to the Cities Service Co. since 1923, died on September 26th in New York in his sixtieth year. The *Electrical World* states that Col. Thompson spent several years with J. G. White & Co., New York, and later became associated with J. G. White & Co., Ltd., of London. In 1903 he joined the British Westinghouse Co., but later returned to the United States and rejoined J. G. White & Co. He was appointed assistant electrical engineer for the New York Public Service Commission in 1908 and in the following year became acting electrical engineer. He resigned to join H. M. Byllesby & Co., of Chicago, as assistant chief engineer, and was appointed manager of engineering and construction in 1913. He remained with the Byllesby organisation until 1923, except for two years' military service.

Mr. J. E. Mallalieu (57), Blackpool, died recently in London. Mr. Mallalieu went to Blackpool thirty-nine years ago and entered the Corporation Electricity Department. Later he was at Dick, Kerr's works, serving for some years on the technical staff. In 1904 he went to Mandalay as chief electrical engineer. He was an A.M.I.E.E., a member of the Institute of Transport, and a Fellow of the Institute of Motor Traders.

Mr. W. Guy-Pell.—We regret to record the death of Mr. William Guy-Pell, founder of William Geipel, Ltd., which occurred on October 22nd, at Sunningdale, at the age of seventy-seven. He became an associate member of the I.E.E. in 1884 and a full member in 1889.

Mrs. C. Binns, wife of Mr. Clifford Binns, distribution engineer, Kettering U.D.C. Electricity Department, died recently at the age of forty.

New Books

Technical Electricity. By J. E. PHILLIPS and R. W. B. STEPHENS. Pp. 288; figs. 187. London: Technical Press, Ltd. Price 7s. 6d.

This book aims at providing an introductory course in electricity and magnetism for technical students, leading up to the first examinations of the City and Guilds and those of some of the Midlands and Northern County Boards. It would appear also to cover the first two years of a National Certificate course. No prior knowledge of the subject is assumed, though the reader is expected to have some acquaintance with the rudiments of mechanics and heat. The order followed is the time-honoured one of magnetism, electrostatics and current electricity, although many teachers nowadays prefer a different sequence. The arrangement also is open to some question, a chapter on magnetic measurements being sandwiched in between those on the electric current and the electric circuit.

On the whole, the authors have succeeded in covering their ground clearly and adequately. Numerous practical examples are given, and the diagrams are clear and plentiful. Standard nomenclature is followed in the main, though there are several notable exceptions *e.g.*, the use of specific resistance and inductive capacity, and in the names of several of the magnetic properties. It was even found necessary to invent a fresh property, "coercivity," though its meaning proves just the opposite of what one would expect from its name. Such minor points should be easily remedied in any subsequent edition.

New British Industries in the Twentieth Century. By A. PLUMMER. Pp. 396; figs. 8. London: Sir Isaac Pitman & Sons. Price 15s.

This is a work for all engineers who wish to get an outside view of their profession and discover what impact it has made upon the country's economy. After a preliminary chapter on changes in demand the book proceeds to describe in some detail recent developments in electricity supply, electrical apparatus manufacture, and motor vehicles and aircraft. In each case a short historical sketch is followed by a general survey of the present position, conditions of pay and employment, tendencies and probable future. In particular the organisation of the industry is described, both on the employers' and the employés' sides, though there are also occasional disquisitions on apparatus (such as the description of an electric lamp) which seem somewhat out of place. Subsequent chapters describe in a similar manner new modes of transport (by road and air), new materials (aluminium and rayon), and the canning of foodstuffs. These are followed by a very full account of State assistance in the new industries, and the results which have accrued.

The book concludes with a short but highly important chapter summarising the author's general conclusions. Special attention is paid to the degree of socialisation, actual and possible, in industries such as electricity supply, transport, fuel, and sugar production. The location of the newer industries is also dealt with, though more could well have been said on this score. The McGowan Report is criticised for its timidity, and some useful suggestions are made. Electrical engineers, of whatever branch, will here learn something of their position in the modern world, and of the contribution they are making to its recent developments. Finally it should be stated that the book is well produced and very well documented.

Shorter Notices

"Life's Spectrum," by W. E. Burnand. Pp. 87; figs. Sheffield: Sir W. C. Leng & Co., Ltd. Price 9d.

"Fine Structure of Matter," by C. H. Douglas Clarke. Pp. 216; figs. 124. London: Chapman & Hall, Ltd. Price 15s.

"First Year Engineering Science—Mechanical and Electrical," by G. W. Bird. (Second edition, revised by B. J. Tams.) Pp. 136; figs. 120. London: Sir Isaac Pitman & Sons. Price 5s.

"The World of Atoms," by A. Haas. (Second edition.) Pp. 183; figs. 54. London: Chapman & Hall, Ltd. Price 10s. 6d.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Harden & Co., Ltd.—Private company. Registered October 6th. Capital, £2,000. Objects: To acquire the business of radio and television dealers, electricians, gramophone dealers, dealers in refrigeration plant and general electrical engineers carried on by E. T. Harden and H. E. Harrison as Harden & Co. The directors are: E. T. Harden, 2, Meadow Way, N.W.9; and H. E. Harrison, 71, Fordwych Road, N.W.2. Secretary: D. A. Harden. Registered office: 124, The Broadway, Cricklewood, N.W.2.

Harvey & MacNaughton, Ltd.—Private company. Registered in Dublin October 8th. Capital, £1,000. Objects: To act as salesmen and vendors of, agents for and dealers in electric vehicles, instruments, articles and products. The directors are: G. J. Britton, address not stated; C. J. Britton, 106, Pembroke Road, Ballsbridge, Dublin; J. Quinn, "Glenmalure," Torquay Road, Foxrock, County Dublin; and one other.

Eryvean, Lavanchy & Co., Ltd.—Private company. Registered October 11th. Capital, £1,000. Objects: To carry on the business of manufacturers of, agents for and dealers in radio receivers, transmitters, resistances, batteries, accumulators, aerials, coils, &c. The first directors are: F. L. Lavanchy, Perran Villa, Truro; L. Edyvean, 7, Grenville Road, Truro; and J. C. Caudell, 26, Broad Street, Truro. Secretary: J. C. Caudell.

A. C. Electric Clocks, Ltd.—Private company. Registered October 9th. Capital, £2,500. Objects: To carry on business as manufacturers of and dealers in electric and other clocks, watches, chronometers and timepieces of all kinds, &c. The directors are: H. E. London, 15, Leaside Avenue, N.10; and M. Whetnall, 89, Sunnybank, Woodcote Park, Epsom. Registered office: Inveresk House, 346, Strand, W.C.2.

L. H. Farmiloe, Ltd.—Private company. Registered October 12th. Capital, £3,000. Objects: To acquire the business of a wireless and electrical appliance dealer heretofore carried on by L. H. Farmiloe at Nottingham. The directors are: L. H. Farmiloe and I. H. Farmiloe, both of 76, Maxwell Avenue, Handsworth, Birmingham, 20; and A. L. Goodliffe, 17, Malvern Road, Mapperley, Notts.

W. H. Hipkiss, Ltd.—Private company. Registered October 13th. Capital, £100. Objects: To purchase, sell and deal in articles relating to the business of electricians, workers and dealers in electricity, motive power and light and apparatus, appliances and things used in connection therewith. The first directors are: W. H. Hipkiss and L. W. Hipkiss, both of 85,

Goodrest Avenue, Howley Grange, Quinton, Worcs. Registered office: Electric House, 18, Bath Row, Birmingham.

Canty & Co., Ltd.—Private company. Registered October 13th. Capital, £300. Objects: To carry on the business of manufacturers of and dealers in radio and electrical apparatus, &c. The directors are: J. Canty and S. E. Canty, both of 112, Newland Avenue, Hull. Secretary: S. E. Canty. Registered office: 58a, Beverley Road, Hull.

Electro Signals & Accessories, Ltd.—Private company. Registered October 11th. Capital £500. Objects: To carry on the business of manufacturers, repairers and hirers of and dealers in electrical and mechanical apparatus, accessories and components, and in particular radio sets and valves, gramophones, radio gramophones, &c. The directors are F. L. Campion, "Lychnis," Hounsden Road, N.21; S. Tanner, 41, Dunedin Road, Leyton; and F. W. Davis, 17, Holcote Gardens, N.21. Registered office: 79, Parkhurst Road, Holloway, N.7.

Dry Accumulator Co., Ltd.—Private company. Registered October 14th. Capital, £100. Objects: To carry on the business of manufacturers and repairers of and dealers in electrical accumulators, batteries, acids and containers, dynamos, motors, transformers, &c. The subscribers are: J. A. Beavan, 69, Moorgate, E.C.2, and Miss E. E. Hart, 51, Mayfield Road, Crouch End, N.8. Secretary (pro tem): E. E. Hart. Solicitors: Stone & Stone, 69, Moorgate, E.C.2.

Fusarc Welding Co., Ltd.—Private company. Registered October 16th. Capital, £7,200. Objects: To carry on the business of manufacturers and repairers of and dealers in all apparatus and electrodes appertaining to electric arc welding, steel ribbon, dynamos, motors and armatures; steel makers and converters, &c. The subscribers are: Mrs. Y. F. Woodrow and F. C. Woodrow, both of 49, Deane Croft Road, Eastcote. Secretary: F. C. Woodrow. Solictors: Tuckey Hussey & Co., 2, South Square, Gray's Inn, W.C.1.

Overbecks Rejuvenator, Ltd.—Private company. Registered October 15th. Capital, £6,000. Objects: To carry on the business of manufacturers of and dealers in all kinds of medical and surgical instruments and in particular the electrical appliance described as "Overbeck's Rejuvenator." The permanent managing directors are: R. C. Smith, 28, St. Ann's Avenue, Grimsby, and E. C. Ayre, 7, Augusta Street, Grimsby.

North Manchester Sound & Television Services, Ltd.—Private company. Registered October 22nd. Capital, £100. Objects: To carry on the business of wholesale and retail dealers in radio, television and electrical apparatus, &c. The subscribers are: E. Greenwood and J. Greenwood, both of 808, Rochdale Road, Queen's Park, Manchester. J. Greenwood signs as director. Registered office: 806, Rochdale Road, Queen's Park, Manchester.

Tudor Woodcrafts, Ltd.—Private company. Registered October 22nd. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical equipment, devices and apparatus, &c. The directors are: D. Harris, 62, Okehampton Road, Kensal Rise, N.W.10 (chairman) and R. Calnan, 94, Sinclair Road, Kensington, W.14. Registered office: 29, D'Arblay Street, W.1.

Cabot Radio Manufacturing Co., Ltd.—Private company. Registered October 23rd. Nominal capital, £500. Objects: To carry on the business of manufacturers, repairers and hirers of and dealers in electrical and mechanical apparatus and accessories and components of all kinds, especially of radio and television sets and valves, gramophones, &c. The directors are: H. A. Malpas and A. E. Malpas, both of 332, St. George, Bristol, 5, and D. W. Brown, 53, Howard Road, Westbury Park, Bristol, 6. Registered office: Oxford Chambers, 12, St. Stephen Street, Bristol.

Simpsons (Nottingham), Ltd.—Private company. Registered October 20th. Capital, £2,000. Objects: To acquire the business of a retail radio dealer now carried on by H. C. Simpson at 73/5, St. Ann's Well Road, Nottingham, as "Simpsons." The directors are: H. C. Simpson (permanent managing director and chairman) and Mrs. O. R. Simpson, both of 73/5, St. Ann's Well Road, Nottingham.

Cobden & Harrison, Ltd.—Private company, Registered October 15th. Capital, £750. Objects: To acquire the business of a radio dealer carried on by E. H. Cobden at Hurst Brow, Martock, Somerset, and to carry on the business of manufacturers of and dealers in radio and television instruments and electrical and radio apparatus of every kind, &c. The first directors are: E. H. Cobden, Hurst Brow, Martock, Somerset; J. A. C. Harrison, Orcharton, Bower Hinton, Martock; and Mrs. E. A. Cobden, Hurst Brow, Martock. Secretary: C. Harrison. Registered office: Hurst Brow, Martock, Somerset.

Electrical and Mechanical Service Co., Ltd.—Private company. Registered October 18th. Capital, £1,000. Objects: To acquire the business of electrical and mechanical engineers heretofore carried on by F. Keown and A. Shore, trading as The Electrical and Mechanical Service Co. at 22, Bolton Street and Kay Brow Works, Ramsbottom, Lancs. The directors are: F. Keown (permanent), 357, Bolton Road West, Holcombe Brook, Ramsbottom; and A. Shore, 68, Dundee Lane, Ramsbottom.

Universal Television.—Private company. Registered October 13th. Nominal capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in all kinds of television and wireless apparatus, &c. The subscribers are: R. G. Rowe and H. Frampton, 18, Austin Friars, E.C. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Davis Motor & Electrical Co., Ltd.—Private company. Registered October 18th. Capital, £500. Objects: To carry on the business of manufacturers and repairers of and dealers in electrical and mechanical apparatus and accessories, and in particular refrigerators, radio sets, &c. The subscribers are: T. H. Davis, 46/48, Ladypool Road, Sparkbrook, Birmingham, 12; and K. W. Cholmondeley, 145, Wednesbury Road, Walsall. T. H. Davis is the first director. Registered office: 46/48, Ladypool Road, Sparkbrook, Birmingham, 12.

Electrogrammes, Ltd.—Private company. Registered in Edinburgh October 21st. Capital, £20,000. Objects: To carry on the business of manufacturers of electric micro-balances and scientific instruments, machines, apparatus and appliances of every description, &c. The subscribers are: A. N. Blair, "Norlen," 24, Atholl Drive, Giffnock, Glasgow, and J. M. L. Morton, 51, Hillhead Street, Glasgow, W.2.

Electrical Equipments (Northern), Ltd.—Private company. Registered October 21st. Capital, £5,000. Objects: To acquire the business of the Electrical Equipment Co., carried on by J. Longhorn, at Cambridge Works, Cambridge Road, Leeds. The permanent joint managing directors are: J. Longhorn, 54, Shaftesbury Avenue, Leeds, 8, and B. S. Hampshire, Manor Court, Cardigan Road, Leeds, 6.

Caloric Electrical Co., Ltd.—Private company. Registered October 21st. Capital, £100. Objects: To carry on business as manufacturers, importers and exporters of and dealers in electrical domestic appliances, cookers, stoves, fires, &c. The subscribers are: A. Fletcher, 38, Wildwood Road, N.W.11, and F. W. Baily, 253, Buckhurst Way, Buckhurst Hill, Essex. Solicitors: Albert Fletcher & Co., 23, College Hill, E.C.4.

Dorothy A'hern, Ltd.—Private company. Registered October 21st. Capital, £1,000. Objects: To acquire the business carried on at Bedford as Dorothy A'Hern, and to carry on the business of artificial florists, lamp shade makers, dealers in electrical goods, drapers, and furnishing and general warehousemen, &c. The directors are: D. A'Hern, 119, Midland Road, Bedford, M. Whittington, 12, Oxford Street, Queen's Drive, W.3, and D. J. Firman, 12, Ferry Road, Barnes, S.W.13. Solicitors: J. M. McDonnell, Jackson & Co., Abbey House, Victoria Street, London, S.W.1.

Returns of Electrical Companies

Universal Electric Time & Telephone Systems, Ltd.—Four mortgages on all sums becoming payable under contracts in respect of rental agreements totalling (a) £159, (b) £501 1s. 3d., (c) £500 6s., and (d) £500 18s., all dated October 6, 1937, to secure (a) £150, (b) £500, (c) £500, and (d) £500, and further advances not exceeding £300, £1,000, £1,000 and £1,000 respectively. Holders: A. G. Steeves, 20, Chapel Street, Liverpool, and others. Mortgage on rental agreement amounting to £625 9s., dated October 11th, 1937, to secure £625 and further payments up to £1,250. Holder: J. Lloyd, "Larkfield," Dunkirk Road, Birkdale, Lancs.

Vulcan Accumulators, Ltd.—The nominal capital has been increased by the addition of £3,000 beyond the registered capital of £3,200. The additional capital is divided into 3,000 preference shares of £1.

Electrical Engineers, Ltd.—Capital, £2,500 in £1 shares. Return dated June 9th, 1937. All shares taken up. £700 paid. £1,300 considered as paid. Mortgages and charges, nil.

Calamco, Ltd.—Capital, £100 in £1 shares. Return dated June 14th, 1937. All shares taken up. £100 paid. Mortgages and charges, nil.

Austin Bros. Electrical Co., Ltd.—Capital, £1,000 in 300 preference and 700 ordinary shares of £1. Return dated July 28th, 1937. All shares taken up. £700 paid. £300 considered as paid. Mortgages and charges, nil.

Fordham Electrical Engineering Co., Ltd.—Capital, £2,000 in £1 shares. Return dated June 19th, 1936 (filed June 8th, 1937). 266 shares taken up. £266 paid. Mortgages and charges, nil.

David Rowan (Vidro), Ltd.—Capital, £7,500 in 3,250 ordinary, 1,750 10 per cent. preference and 2,500 6 per cent. "A" preference shares of £1. Return dated July 15th, 1937. 3,250 ordinary, 1,186 10 per cent. preference, and 800 "A" preference shares, £2,736 paid on 750 ordinary, 1,186 10 per cent. preference and 800 "A" preference shares, £2,500 considered as paid on 2,500 ordinary shares.

Laurence, Scott & Electromotors, Ltd.—Mortgage on land with power station, &c., thereon, in Thorpe, Norfolk, dated October 12th, 1937, to secure £8,000. Holders: J. & J. Colman, Ltd., Carrow Works, Norwich.

E. K. Cole, Ltd.—Capital, £650,000 in 250,000 5½ per cent. 1st cumulative preference and 200,000 7 per cent. cumulative participating preferred ordinary shares of £1, and 800,000 ordinary shares of 5s. Return dated June 3rd, 1937. 250,000 1st preference, 184,480 preferred ordinary and 745,600 ordinary shares taken up. £520,220 paid on 250,000 1st preference, 184,480 preferred ordinary and 342,960 ordinary shares, £100,660 considered as paid on 402,640 ordinary shares. Mortgages and charges nil.

Bradford Electrical Services, Ltd.—Capital, £1,000 in £1 shares. Return dated July 20th, 1937. All shares taken up. £1,000 paid. Mortgages and charges nil.

Buckrose Light & Power Co., Ltd.—Capital, £150,000 in £1 shares. Return dated July 5th, 1937. 125,000 shares taken up. £125,000 paid. Mortgages and charges nil.

E. P. Cottier, Ltd.—Capital, £1,000 in £1 shares. Return dated June 7th, 1937. 660 shares taken up. £660 paid. Mortgages and charges nil. Return of allotments, made up to June 9th, 1937, shows a further 10 shares allotted for cash and fully called up.

East Midland Electrical Co., Ltd.—Satisfaction in full on October 8th, 1937, of debentures authorised July 1st, 1932, and registered July 6th, 1932, securing £3,000.

Electrical Sound & Television Patents, Ltd.—The nominal capital has been increased by the addition of £900 in £1 ordinary shares beyond the registered capital of £100.

Simmonds & Stokes, Ltd.—Particulars filed of (a) 5th series of second debentures to secure £2,500, and (b) 6th series of second debentures to secure £500, authorised September 17th, 1937, and charged on the company's undertaking and property, present and future, including uncalled capital, the amounts of the present issue being £800 and £200, respectively.

Northampton Electric Light & Power Co., Ltd.—Particulars filed of £600,000 debentures (inclusive of £300,000 already registered) authorised by resolutions of December 14th, 1933, and September 14th, 1937, and covered by trust deeds dated October 12th, 1937, charged on the properties charged by trust deed dated January 16th, 1934. The amount of the present issue is £100,000. Trustees: Royal Exchange Assurance. (The £100,000 stock is being issued at a discount of 2 per cent.).

Lukely Engineering & Moulding Co., Ltd.—Mortgage on Lukeley Engineering Works, Carisbrooke Road, Newport, I.o.W., dated September 28th, 1937, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

British Vibralux, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated September 30th, 1937, to secure £1,000. Holder: G. T. Harris, 11, Maiden Lane, E.C.4.

Madras Electric Supply Corporation, Ltd.—Capital, £1,100,000 in 476,800 preference and 623,200 ordinary shares of £1. Return dated June 9th, 1937. 451,800 preference and 598,200 ordinary shares taken up. £944,000 paid on 398,600 preference and 545,400 ordinary shares. £106,000 considered as paid on 53,200 preference and 52,800 ordinary shares. Mortgages and charges nil.

Edmundson's Electricity Corporation, Ltd.—Capital, £7,000,000 in £3,740,000 ordinary stock, £1,396,005 6 per cent. cumulative preference stock, £400,000 7 per cent. preference stock and 860,000 ordinary and £603,995 6 per cent. cumulative preference shares of £1. Return dated June 10th, 1937. All stock taken up. £2,810,400 paid on £1,160,400 ordinary stock, £1,250,000 6 per cent. cumulative preference stock, and £400,000 7 per cent. cumulative preference stock. £2,725,605 considered as paid on the remainder. Mortgages and charges, £4,386,110.

Calcutta Tramways Co., Ltd.—Capital, £1,400,000 in 950,000 ordinary and 450,000 preference shares of £1. Return dated May 25th (filed June 10th), 1937. 700,000 ordinary and 250,000 preference shares taken up. £764,900 paid, being 8s. on 22,000 ordinary, 10s. on 40,000 ordinary, 14s. on 110,000 ordinary and £1 on 409,100 ordinary and 250,000 preference). £185,100 considered as paid (being £1 on 118,900 ordinary, 12s. on 22,000 ordinary, 10s. on 40,000 ordinary and 6s. on 110,000 ordinary). Mortgages and charges, £350,000 1st debentures and £250,000 2nd debentures.

Brighton Radio Circuit, Ltd.—Capital, £8,000 in £1 shares. Return dated August 9th, 1937. 5,402 shares taken up. £4,727 paid (£1 on 2 shares and 17s. 6d. on 5,400 shares). Mortgages and charges, nil.

Ashton Electrical Company (Preston), Ltd.—Capital, £5,000 in 4,750 ordinary and 250 founders' shares of £1. Return dated July 21st, 1937. 3,633 ordinary and 250 founders' shares taken up. £3,733 paid on 3,633 ordinary and 100 founders' shares. £150 considered as paid on 150 founders' shares. Mortgages and charges, £3,271 8s.

City Notes

Ferranti, Ltd., held their annual meeting on October 20th, when Mr. V. Z. de Ferranti (chairman and managing director), who presided, said that the turnover of the business had again increased. The net profit of £64,923 showed an improvement of £7,485 over the previous year, and this was exclusive of the results of the two subsidiary companies, both of which had done well during the past twelve months. A sum of £23,475 had been spent on additional buildings, while plant, machinery, tools, &c., showed an increase of £14,093. The value of unexecuted orders in hand at the commencement of the present financial year was considerable and much larger than at the same period in 1936, both for the ordinary commercial products and for the special requirements of the Government. In conclusion, the chairman referred to the agreement made since last year's meeting between the Engineering Employers' Federation and the engineering unions for a week's holiday with pay, which would apply to the whole of their workpeople and also to the contributory staff pension scheme which was put into operation in May last.

London Associated Electricity Undertakings, Ltd., announces that the Electricity Commissioners have approved a scheme of physical amalgamation of the following constituent companies: Brompton & Kensington Electricity Supply Co., Ltd.; Charing Cross Electricity Supply Co., Ltd.; Chelsea Electricity Supply Co., Ltd.; Kensington & Knightsbridge Electric Lighting Co., Ltd.; St. James' & Pall Mall Electric Light Co., Ltd.; and Westminster Electric Supply Corporation, Ltd. Application will be made to the Courts for approval of such amalgamation under the Companies Act, 1929. The directors of the following companies, namely, Chelsea Electricity Supply Co., Ltd., Kensington & Knightsbridge Electric Lighting Co., Ltd., and St. James' & Pall Mall Electric Light Co., Ltd., have resolved to repay the outstanding debenture stock of each company as at April 20th, 1938. This step does not in any way affect the rights and privileges of the stockholders of London Associated Electricity Undertakings, Ltd.

Erinoid, Ltd., held its annual meeting on October 21st, when Mr. W. G. Waldron, who presided, referred with regret to the death of Mr. A. Binnie, the chairman, which occurred on October 15th. In reviewing the accounts Mr. Waldron said that a change in the fashion trades had caused a considerable decrease in sales. To broaden the basis of the business two processes were being developed in addition to other minor processes. Cost of production had been reduced during the year and the full effect of this would be felt in the coming year. He was confident that with reduced cost of production and, as they had reason to anticipate, increased sales, the current year should yield a satisfactory result apart from any profit which would eventually accrue from the new processes. The installation of these processes was to some extent delayed owing to difficulty in obtaining the whole of the necessary equipment.

Radio Central Exchanges report a net profit for the year ended May 31st of £410, as compared with £1,898 in the previous year, to which is added £4,653 brought in, making £5,064 to be carried forward. The report states that each of the subsidiaries has earned satisfactory profits, only a small portion of which was distributed to the parent company by way of dividends. The Post Office licences under which the subsidiaries operate, have been extended to December 31st, 1939, but no indication has yet been given by the Government as to what is to happen to relay exchanges after that date.

Herbert Morris, Ltd., report a net profit for the year ended July 31st of £150,910, as compared with £96,807 in the preceding year. The balance is struck after making allowance for income tax and N.D.C. and £23,437 to depreciation. The final ordinary dividend is 25 per cent., making 27½ per cent. net for the year. For the previous year the distribution totalled 17½ per cent. on smaller capital, a scrip bonus of 33⅓ per cent. in ordinary shares having been distributed in July, 1936. A sum of £20,000 is placed to reserve and £50,224 is carried forward, as against £39,313 brought in.

The Tata Power Co. reports a net profit for the year ended June 30th of Rs.34,10,779, as against Rs.32,86,680 in the previous year, to which is added Rs.4,54,293 brought in. Reserve for special repairs receives Rs.3,579, income tax and super tax reserve Rs.5,01,600, and general reserve Rs.2,00,000. The final ordinary dividend is Rs.37 8 0, tax free, making Rs.60, and Rs.4,68,997 is carried forward.

The Tata Hydro-Electric Power Supply Co., in its report for the year ended June 30th, shows a net profit of Rs.24,34,719, as compared with Rs.26,57,322 in the preceding year, to which is added Rs.3,03,932 brought in. From this, Rs.80,577 is allocated to writing down conversion bonus, brokerage and expenditure on debenture loan, Rs.41,123 to reserve for special repairs, and Rs.4,29,400 to reserve for income tax and super tax. The final ordinary dividend is Rs.4 8 0 per share (tax free), making Rs.7 8 0 and Rs.2,12,591 is carried forward.

The Andhra Valley Power Supply Co. reports a net profit for the year ended June 30th of Rs.21,82,643, as compared with Rs.18,46,527 for 1935-36. The final ordinary dividend is Rs.45, making Rs.75 for the year, and Rs.3,85,330 is carried forward (against Rs.3,62,425 brought in).

Companies to be Struck Off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—Electrical Leakage Detectors, Ltd.; Electrical Relay Co., Ltd.; Kolhapur Hydro-Electric & Aluminium Co., Ltd.; H. & J. Radio, Ltd.; Herald Electric Stores, Ltd.; Hiraradio, Ltd.; Kent Electrical Co., Ltd.; M. & B. Radio, Ltd.; Wiring Installations (Housing), Ltd.

The Ever Ready Co. (Great Britain), Ltd., has announced an interim ordinary dividend of 15 per cent., actual, less tax (same). The dividend is payable on £944,765 of capital, as against £836,502 last year. The company's business, it is stated, is progressing satisfactorily.

The Nigerian Electricity Supply Corporation, Ltd., is paying an interim dividend of 3½ per cent., less tax, on the preferred ordinary shares. No interim was paid last year, but the final distribution was 7½ per cent.

The Calcutta Electric Supply Corporation, Ltd., has declared an interim dividend on the ordinary stock of 4 per cent. (actual), free of income tax. This compares with 5 per cent., tax free, last year, but is paid on £396,229 additional capital.

The Northampton Electric Light & Power Co. has placed privately £100,000 of 3½ per cent. debenture stock at 98. This issue brings the total up to the authorised amount of £600,000.

The Urban Electric Supply Co., Ltd., has declared an interim dividend of 3 per cent., less tax (unchanged).

Broadcast Relay Service has announced an interim dividend of 5 per cent., less tax (same).

The Shanghai Electric Construction Co. has announced an interim dividend of 2 per cent., less tax (against 4 per cent.).

Dictograph Telephones, Ltd., is paying an ordinary dividend of 7½ per cent., actual, for the initial period of nine months ended August 31st.

Stocks and Shares

TUESDAY EVENING.

THE course of Stock Exchange markets continues to be chequered by the moods of Mussolini and the movements in Americans. Members of the House in London protest against a present condition of affairs in which London Stock Exchange prices seem to take their cue from the erratic fluctuations of Wall Street. The wild movements in Americans not only have a definite effect upon prices on this side, but they undoubtedly check enterprise and business. Every now and then, it appears as though London were escaping from the Wall Street influence, but, on any violent surge of speculation in America, the markets on this side become once more coloured by the Transatlantic Kaleidoscope.

The imposition by Mussolini of qualifications upon his previous attitude in regard to non-intervention in Spain, has introduced a further restraint upon the return of confidence. On the whole, it is surprising that the quotations should be standing up so well as they do to the conflicting circumstances of the time. This in itself is regarded as an indication that any sign of settlement in Europe, Asia or America, would be followed by a return of confidence and of general business in securities.

Electricity's Example

Parliament reassembled on Tuesday in this week, and it is expected that, in spite of a very heavy programme, the Government will make an effort to deal with the ambitious electrification scheme introduced during the summer. The Stock Exchange market in electricity supply shares declines to be perturbed by whatever uncertainty the prospect may hold. In the market, the opinion remains that nothing tangible is likely to emerge for at least six or nine months, and that in the meantime the companies will continue, among themselves, their quiet policy of linking-up and unification where they consider it to be desirable.

Supply Shares

The market in Home electricity supply shares has continued to present a comparatively unruffled front to surrounding events. The proposed merger of the constituent companies of London Associated Electricity Undertakings was of interest to the market mainly as an example of how the policy of some of the companies is running ahead of the legislation expected during the coming session of Parliament. The shares of the Associated company were not affected. In the overseas group, some activity persisted in Perak Hydros, at around 25s. 3d., by reason of the tenor of the recent meeting. The interim dividend of 4 per cent. declared by Calcutta Electric compares with a corresponding dividend of 5 per cent. on last year's smaller capital. It has been officially stated that the normal annual rate of dividend must in future be regarded as 10 per cent., instead of the 12 per cent. previously paid. The dividends are paid free of income tax. The price at 39s. 3d. is 6d. lower. Palestine Electric "A" shares eased off to 33s. 6d., on the news from that country, but Jerusalems were maintained at 24s. 6d. Tokyo "sixes," at 59, are steadier; the price has drop in recent months from over 80. Whitehall Electrics at a guinea are 1s. down.

America's Influence

The headlong slump in American stocks and shares has been checked. It would appear that the seriousness of the situation created by the crash in Wall Street was recognised, although tardily, by American Big Business and the American Government alike. Support came in to rally the whole of the list. American Telephone and Telegraph regained 5 of its 9 points drop. Western Unions recovered to 32¼. Amongst the lower-priced shares affected by the slump, Canadian Marconis advanced from 3s. 9d. to 6s. 6d., to revert later to 5s. 9d. International Telephone and Telegraphs are weak at 6⅜. In some of the more vulnerable American shares, the range from highest and lowest prices was 15 points in less than a week.

Investment's Changing Trend

The steady depreciation of prices that started, it may be remembered, when Mr. Chamberlain introduced his first and unfortunate N.D.C. proposals, is bringing about a gradual change in the trend of investment. Six months ago, people with money were content to buy ordinary shares in sound industrial companies on the basis of a yield frequently less than 4 per cent. Justification for acceptance of a gilt-edged return was found in the argument that the purchaser was looking ahead and expected to get increased income in years to come, he being more actuated at the time of his purchase of the shares by consideration of earning power than by the immediate dividend distribution. Prices were run up to very high levels. In the descent from them, investment requirements underwent a gradual alteration. People nowadays are asking for a reasonable rate of interest on their money, here and now. They are, in other words, taking a shorter view, argument to-day being that costs of living and other things are on the rise, and that it is essential for investments to give a correspondingly increased income.

The matter is one of general interest in that it affects the value of stocks and shares in all kinds of industrial companies. The fall in the prices of gilt-edged and fixed-interest stocks, which has also taken place during the period, must be imputed to other considerations. It is in the groups of ordinary shares that the change in the investor's viewpoint is being brought about by the considerations just mentioned. Prices of electrical equipment shares generally show little alteration over the past week. Henley's, however, are up to £1, and Crompton Parkinsons have strengthened to 2⅝. Brush has put on a point, to 33½.

Ever-Ready

Ever-Ready shares have been following the general run of prices, with the result that the yield on the last-paid dividend still remains conspicuous for its generosity in the list of electrical equipment shares. For last year, the distribution was raised from 35 per cent. to a total of 45 per cent., including a 10 per cent. cash bonus. The interim dividend of 15 per cent. now declared is at the same rate as before, and leads to the expectation that last year's total will be maintained. At that rate the return on the 5s. shares at the present price of 29s. 3d. comes to well over 7½ per cent., or about 3 per cent. higher than the yields at present obtainable from shares in many of the more general manufacturing concerns.

Miscellaneous Matters

In the gilt-edged market a moderate demand continues to get rather the better of the supply. Little disturbance has been caused by the resumption of Home Corporation borrowing. Prices of British Government and other safety-first stocks show small gains on the week. Home rails derived but meagre encouragement from the first traffic returns to be issued under the new conditions for fares and freights. Brazilian Tractions jumped from 15⅜ to 17⅜ as soon as Wall Street looked like taking a turn for the better. Some Argentine tramway and traction debentures have been heavy on fears that the intended Buenos Aires Transport Board may be longer in taking shape than had been anticipated. But Anglo-Argentine first preference are 1/6 better at 6s. 3d. Cable and Wireless ordinary remains flat at 67½; the preference rose a point to 101½, coming into line with the price of the income stock.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price Oct. 26.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	34/6	—	4 7 0
Clyde Valley	1	7	8	40/–	–6d.	4 0 0
County of London	1	10½	10½	49/–	—	4 5 9
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	39/–	—	4 12 4
Elec. Dis. Yorkshire	1	9	9	41/6	—	4 6 10
Elec. Fin. and Securities	1	12½	12½	2⅝	—	4 15 3
Elec. Supply Corporation	1	11	12	52/6	—	4 11 5
Lancs Light and Power	1	7½	7½	32/6	—	4 12 4
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	105½	—	4 14 9
Metropolitan	1	10	10	46/–	—	4 7 0
Midland Counties	1	7½	8	37/6	—	4 5 4
Mid. Elec. Power	1	8	9	2½	—	4 4 8
North Eastern Electric Ordinary	1	6	7	2/–	+6d.	4 [illegible] 6
Do. 7% Pref.	1	7	7	34/–	—	4 2 4
Northampton	1	10	10	45/–	—	4 9 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	48/9	—	4 2 1
Do. do. 6% Pref.	1	6	6	30/6	—	3 18 8
Scottish Power	1	8	8	37/–	—	4 [illegible] 6
South London	1	7	7	32/–	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/–	–1/–	7 [illegible] 10
Yorkshire Elec.	1	8	8	2	—	4 9 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	112½	—	4 9 0
Do. 1955–75	,,	5	5	115	—	4 7 0
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	—	3½	99	+1	3 10 8
London Elec. Trans. Gtd.	,,	—	2½	90	—	2 15 6
London & Home Counties, 1955–75	,,	4½	4½	111	—	4 1 1
London Passenger Transport, A	,,	—	4½	113½	—	3 19 4
Do. do. B	,,	—	5	117½	—	4 5 1
Do. do. C	,,	4	4½	79	—	5 7 8
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	155	+5	5 15 7
Anglo-Am. Tel. Pref.	Stock	6	6	115½	—	5 4 0
Do. Def.	,,	1½	1½	28½	–1	5 5 3
Cable & Wireless 5½% Pref.	,,	4⅛	5½	101½	+1	5 9 5
Do. Ord.	,,	—	—	67⅛	—	—
Do. Income	,,	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	16	—	3 8 8
Do. do. Pref.	10	6	6	14	–⅛	4 5 9
Great Northern Tel.	10	20	20	39	—	5 2 7
Marconi-Marine	1	10	7½	33/9	—	4 9 0
Oriental Telephone Ord.	1	12*	12*	2 1/16	—	4 0 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	6/3	+1/16	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	17½	—	—
British Electric Traction Def. Ord.	,,	5	5	1075	—	—
Do. do. Pref. Ord.	,,	8	8	168	—	4 15 5
Brazil Traction	$100	40 cts.	50 cts.	17⅜	+2	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	33	—	—
Victoria Rails Ord.	1	20	12	3⅛	+1/16	3 18 5
West Riding	1	6½	10	2	—	5 0 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	2⅜	—	6 6 4
Assoc. Elec. Ord.	1	8	10	44/6	—	4 9 10
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	46/3	+1/3	4 6 6
British Aluminium Ord.	1	7½	10	46/3	+1/16	4 6 6
British Insulated Ord.	Stock	20	20	4⅜	—	4 6 6
Brush Ord.	Stock	Nil	Nil	33½	+1	—
Callender's	1	15	15	4 7/16	—	3 7 8
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/–	12½	12½	2⅜	+1/16	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	1 13/16	—	5 10 4
Enfield Cable Ord.	1	25	25	5 1/16	—	4 17 0
English Electric	1	Nil	Nil	31/–	+6d.	—
Do. do. Pref.	1	6½	6½	26/6	—	4 18 1
Ericsson Tel.	5/–	20	25	2 3/16 xd.	—	2 17 2
Ever Ready	5/–	35	45	29/3	—	7 13 7
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	78/6	+6d.	4 8 5
Henley's	5/–	30	15	1	+1/16	3 15 0
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	7½	10	42/6	—	4 14 1
Lancashire Dynamo	1	10	20	3⅜	—	5 18 6
Siemens Ord.	1	6	7½	30/9	—	4 17 7
Telegraph Construction	£1	Nil	7½	2½	—	3 6 8

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

5626. "Broadcast receiving sets." General Electric Co., Ltd., and R. Gosden. February 25th, 1936. (472631.)

6025. "Carrier signalling systems." General Electric Co., Ltd., E. P. L. Westell and D. A. Ley. February 28th, 1936. (472816.)

6093. "Electron multiplying electric-discharge devices." Marconi's Wireless Telegraph Co., Ltd. February 28th, 1935. (472896.)

9007. "Electric oscillation generators." Baird Television, Ltd., and G. R. Tingley. March 26th, 1936. (472645.)

9057. "Devices for fixing coiled filaments to the filament supports of incandescent electric lamps." G. Brickner. March 26th, 1936. (472647.)

9060/1. "Gas- or vapour-filled electric discharge tubes." F. J. Cleveland (N. S. Oerensofi). March 26th, 1936 (472648/9.)

9067. "High-frequency signalling systems." Marconi's Wireless Telegraph Co., Ltd. March 26th, 1935. (472650.)

9069. "Radio direction-finding installations." Marconi's Wireless Telegraph Co., Ltd., S. B. Smith and E. Green. March 26th, 1936. (472651.)

9118. "Metal-clad electric switchgear." A. Reyrolle and Co., Ltd., A. Allan and N. R. Blanch. March 27th, 1936. (472656.)

9156. "Electric-discharge lamps." General Electric Co., Ltd., V. J. Francis and J. W. Ryde. March 27th, 1936. (472658.)

9250. "Systems and apparatus for controlling the frequencies of electric currents." Baird Television, Ltd., and P. W. Willans. March 28th, 1936. (472686.)

9256. "Arrangements for suppressing magnetic saturation phenomena in electric alternating current power circuits." Telefonaktiebolaget L. M. Ericsson. April 1st, 1935. (472687.)

9262. "Method and arrangement for modulation of television transmitters with image and synchronisation signals." Radioakt.-Ges. D. S. Loewe. March 28th, 1935. (Cognate application 9263/36.) (472900.)

9267. "Means for providing high-voltage impulses." British Thomson-Houston Co., Ltd., H. De B. Knight and T. F. Robinson. March 28th, 1936. (472826.)

9278. "Protective gear for alternating-current systems." T. W. Ross, M. Kaufmann, and Metropolitan-Vickers Electrical Co., Ltd. March 28th, 1936. (472663.)

9287. "Telephone instruments." D. S. S. Steuart and N. B. M. Douglas-Hamilton, Duchess of Hamilton and Brandon. March 28th, 1936. (472901.)

9288. "Television and like systems." Baird Television, Ltd., and V. A. Jones. March 28th, 1936. (472762.)

9394. "Traffic-control systems." Automatic Electric Co., Ltd., A. P. B. Renshaw and G. W. Thompson. March 30th, 1936. (472832.)

9396. "Manufacture of dry rectifiers, photo-electric cells, elements for thermo-electric couples, and the like." H. Rupp. March 30th, 1936. (472961.)

9409. "Regenerative braking systems for direct-current electric motors." British Thomson-Houston Co., Ltd., H. W. C. Liddiard, T. H. Petch, Junr., and J. W. Crofts. March 30th, 1936. (472833.)

9427. "Electro-magnetic deflecting apparatus for television and other cathode-ray tubes." Telefunken Ges. für Drahtlose Telegraphie. March 28th, 1935. (472834.)

9521. "Electric relays." Associated Electric Laboratories, Inc. April 26th, 1935. (472840.)

9550. "Manufacture of electric insulating bushings, cylinders, tubes, and similar bodies." A. P. M. Fleming and Metropolitan-Vickers Electrical Co., Ltd. March 31st, 1936. (472969.)

9644. "Electric welding machines." British Thomson-Houston Co., Ltd., and J. Donkin. April 1st, 1936. (472909.)

9645. "Electric switchgear installations." British Thomson-Houston Co., Ltd., and H. Trencham. April 1st, 1936. (472910.)

9764. "Television and like systems." Baird Television, Ltd., and V. Jones. April 2nd, 1936. (472980.)

9783. "Electric clock movements." British Sangamo Co., Ltd., and F. R. Butherus. April 2nd, 1936. (472983.)

9790. "High-frequency electric cables." Siemens & Halske Akt.-Ges. April 17th, 1935. (Cognate application 9791/36.) (472696.)

9800. "Current-transformers." British Thomson-Houston Co., Ltd., and A. C. T. Isaac. April 2nd, 1936. (472986.)

9868. "Permanent magnets for electricity meters." Chamberlain & Hookham, Ltd., and S. James. April 3rd, 1936. (472915.)

9877. "Filter amplifier for television synchronisation purposes." Radioakt.-Ges. D. S. Loewe. April 6th, 1935. (472992.)

9883. "Alternating-current signalling systems." Standard Telephones & Cables, Ltd., and E. A. H. Bowsher. April 3rd, 1936. (472993.)

9973. "Telephone systems." Automatic Electric Co., Ltd., R. Taylor and G. T. Baker. April 3rd, 1936. (473003.)

10009. "Electron-discharge apparatus." Baird Television, Ltd., and V. Jones. April 4th, 1936. (473006.)

10024. "Control of electric winches." W. H. Scott. April 4th, 1936. (472916.)

11622. "Electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). April 23rd, 1936. (472918.)

11878. "Rotary commutator switching apparatus for converting electric currents." Siemens-Schuckertwerke Akt.-Ges. April 27th, 1935. (472706.)

11918. "Electric-discharge lamps comprising luminescent materials." General Electric Co., Ltd., A. H. McKeag and J. T. Randall. April 27th, 1936. (472769.)

12120. "Noise suppression in radio receivers during the tuning thereof." E. K. Cole, Ltd., and H. Hunt. April 29th, 1936. (472922.)

12215. "Television and like receivers." Marconi's Wireless Telegraph Co., Ltd., R. J. Kemp and D. J. Fewings. April 29th, 1936. (472923.)

12411. "Electric cable systems." Okonite-Callender Cable Co., Inc. May 8th, 1935. (472770.)

13495. "Electric switches of the push-button type." J. A. Crabtree & Co., Ltd. (Schiele & Bruchsaler Industriewerke Akt.-Ges.). May 13th, 1936. (472924.)

13825. "Control systems for reversing electric motors." British Thomson-Houston Co., Ltd. May 17th, 1935. (472925.)

14102. "Remote-control systems for radio and other high-frequency apparatus." L. L. De Kramolin. May 18th, 1935. (Addition to 449240.) (472710.)

14863. "Portable electric appliances with electric motors." General Electric Co., Ltd., and L. G. Ward. May 26th, 1936. (472774.)

15037. "Radio receivers." E. K. Cole, Ltd., and G. Bradfield. May 28th, 1936. (472712.)

17417. "Electron-discharge devices such as television image-dissectors." Farnsworth Television, Inc. July 1st, 1935. (472859.)

17419. "Cathode-ray tubes." Farnsworth Television, Inc. July 6th, 1935. (472860.)

17420. "Method of and apparatus for modulating electron streams." Farnsworth Television, Inc. July 6th, 1935. (472861.)

17421. "Cathode-ray tubes for television or like systems." Farnsworth Television, Inc. July 6th, 1935. (472862.)

19064. "Control gear for electric cranes and the like." British Thomson-Houston Co., Ltd. July 9th, 1935. (472937.)

19522. "Joints for adjustable electric light brackets, stands or supports." W. A. F. Tribe. July 14th, 1936. (472715.)

21575. "Secondary emission electron multipliers." General Electric Company, Ltd., and D. W. Fry. August 5th, 1936. (472717.)

23234. "Device for fixing electric conductors or pipes containing such conductors to walls, ceilings, and the like." T. R. Van Til. August 24th, 1935. (472778.)

25134. "Electric circuit interrupters." Westinghouse Electric & Manufacturing Co. September 26th, 1935. (472721.)

25434. "Silencing devices in wireless receiving sets." General Electric Co., Ltd., and N. R. Bligh. September 18th, 1936. (472722.)

26785. "Impedance matching terminations for dielectric guides." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). October 2nd, 1936. (472725.)

27468. "Radio transmitting systems." R. J. Berry (C. Lorenz Akt.-Ges.). October 9th, 1936 (Convention date not granted.) (472941.)

29558. "Telegraph transmitters." Creed & Co., Ltd. November 4th, 1935. (472728.)

1937

2779. "Resilient sockets or clips for electrical connections." A. Giroud. January 31st, 1936. (472945.)

3240. "Radio receivers and the like." Marconi's Wireless Telegraph Co., Ltd. March 26th, 1936. (472739.)

3873. "Electric irons." G. Campana. February 10th, 1936. (472675.)

8371. "Indicator dials for radio receiving sets." Fabrica Italiana Magneti Marelli. March 24th, 1936. (472802.)

9202. "Electric tumbler switches." A. F. Bulgin & Co., Ltd., and A. F. Bulgin. March 31st, 1937. (472748.)

9900. "Electrical measuring instrument arrangements." Marconi's Wireless Telegraph Company, Ltd. April 7th, 1936. (472951.)

9918. "High-frequency carrier-wave transmission systems." Standard Telephones & Cables, Ltd. April 7th, 1936. (472806.)

10808. "Torsional oscillation damper devices." Daimler-Benz Akt.-Ges. April 15th, 1936. (472807.)

12047. "Telephone systems." Automatic Electric Co., Ltd., R. Taylor and G. T. Baker. April 3rd, 1936. (Divided out of 473003.) (473015.)

13046. "Devices for spacing wires employed in wireless telegraphy and telephony." E. J. Jobling-Purser and J. A. Jobling & Co., Ltd. May 7th, 1937. (472752.)

13970. "Caps for electric incandescent lamps or the like." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). May 19th, 1937. (472753.)

16132. "Circuit arrangements for rectifying modulated high or intermediate frequency oscillations and for amplifying the oscillations obtained after rectification." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 13th, 1936. (472956.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 20th :—

Taxograph, Albiswerk Zurich A.G. (lettering and design). No. 578471. Class 8. Telephonic and telegraphic instruments and apparatus and parts thereof.—Albiswerk Zurich Gesellschaft, Zurich, Switzerland (British representatives, G. F. Redfern & Co., 15, South Street, E.C.2).

Sunfra. No. 579278. Class 11. Instruments, apparatus and contrivances (not medicinal) for surgical or curative purposes or in relation to the health of men or animals.—Watson & Sons (Electro-Medical), Ltd., 43-45, Parker Street, Kingsway, W.C.2.

Notekol. No. 579246. Class 50. Polishing preparations.—Notek Electric Co., 175, Merton Road, S.W.19.

I.E.E. Transmission Section Dance

The annual conversazione and dance of the Transmission Section of the Institution of Electrical Engineers will be held on November 3rd at the Criterion Restaurant, Piccadilly, W.1. The charge per person is 10s. 6d., which includes dancing and a five-course supper. Application for tickets should be made to the secretary of the Institution, Savoy Place, Victoria Embankment, W.C.2.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeenshire.—School, Peterhead; architect, County Education Committee, Aberdeen.

Armadale (WEST LOTHIAN).—Cinema, South Street, for the Star Theatre (Armadale), Ltd.; R. Pert & Sons, Ltd., contractors, Montrose.

Ashton-under-Lyne.—Cinema, Queen's Road, for Roxy Cinema (Ashton), Ltd.

Audenshaw.—Alterations and additions to branch bank, 7, Guide Lane, near Ashton-under-Lyne, for Midland Bank, Ltd., Poultry, London, E.C.2; Taylor & Simister, architects, Halifax Chambers, Oldham.

Batley.—Houses, Purlwell Farm estate, Mount Pleasant; Albert & Co., Ltd., builders, Ravenshouse Road, Dewsbury.

Bexhill-on-Sea.—Development of Church Farm estate, for Wrestwood Estates, Ltd.; E. Bunce, architect.

Bill Quay (Co. DURHAM).—Cabinet factory, for the Co-operative Wholesale Society; C.W.S. Building Dept., West Blandford Street, Newcastle-on-Tyne.

Birkenhead.—Flats (24), Shrewsbury Road, for Victoria Estates, Ltd.; R. V. Smith.

Blackburn.—Houses (44), with garages, &c., near Lammack Road; Russell Bros., builders, Wade House Road, Nelson.

Blackpool.—Houses (30), Blairway Avenue, &c.; T. Parkinson, Torsway Avenue.

Bournemouth.—Factory and offices, Ringwood Road; British Incorrodible Metal Co. Hotel, Broadhurst Avenue, Eldridge Pope & Co., Ltd. Extensions to works, Poole Road; Citax, Ltd.

Brighton.—Bungalows, Manor Farm estate (£4,993); borough engineer. Pavilion, Pier Head; Marine Palace & Pier Co. Extension to factory, Lewes Road; Allen West & Co., Ltd.

Bucknall (STAFFORDSHIRE).—Estate development, Eaves Lane and Greasley Road, for H. Clowes; Adams & Edwards, architects.

Cardiff.—Houses (15), Bishop's Walk; S. Swail. Houses (92), Whitaker Road (£33,000); Copp Bros., Ltd.

Carlisle.—Offices, Murrell Hill; Morton Sundour Fabrics, Ltd. Shopping centre, Morton Park estate; J. Laing & Son, Ltd.

Chester-le-Street.—Cinema, Birtley; H. Wiles, architect, 24, Bideford Gardens, Low Fell, Gateshead-on-Tyne.

Chigwell.—Houses, Loughton, Buckhurst Hill, Chigwell Row; G. Holbourn, U.D.C. surveyor, Council Offices, Loughton, Essex.

Clydebank.—Houses, Drumry site and Mount Blow site; A. G. Merriles, burgh surveyor, Municipal Buildings, Clydebank. Extensions to factory, for J. Brockhouse & Co., Ltd.

Consett.—Cinema, for Robson Brothers; J. H. Simson, architect, 128, Grainger Street, Newcastle-on-Tyne.

Coulsdon.—Houses (12), Waddington Avenue; A. E. Hendra.

Coventry.—Houses (170), Stoke Aldermoor (£78,994); city engineer.

Crayford.—Cinema with shops, Rochester Way, for D. Weston; A. W. Kenyon, architect, 21, Bedford Square, London, W.C.1.

Crook (Co. DURHAM).—Cinema, for Edwards Syndicate; A. J. Lamb, architect, 16, Dean Street, Newcastle-on-Tyne.

Croydon.—Schools, Addington, Waddon, Shirley Road and technical college, Duppas Hill, for E.C.

Cwmbran.—Engineering factory, for Saunders Valves Co., Ltd.

Cyfartha (MERTHYR).—Factory, British Sewing Machine Co.

Derby.—Municipal buildings; C. H. Aslin, borough architect, Gower Street.

Dorset.—School, Shaftesbury, for the C.C.; C. P. Brutton, clerk, County Offices, Dorchester.

Evesham.—School (£22,000), Blackminster; G. Forster, builders, Broadway, Worcester.

Farnworth.—Dairy for Farnworth and Kearsley Industrial Society, Ltd., Market Street; S. Peck, architect, Reform Club Buildings, 9, Peel Street.

Felling-on-Tyne.—Houses (203), three sites; U.D.C. surveyor.

Glamorganshire.—School, Bishopston; the County E.C., County Hall, Cardiff.

Great Yarmouth.—Houses (66), Marsh Road, Bells Marsh Road and Gordon Road; borough engineer, Town Hall.

Hanley.—Houses (16), Fenton Road; J. Berresford. Houses (40), near Queen's Road; R. Ray & Son. Market (£16,500); Stoke city engineer.

Horwich.—Premises, Black Horse Street, Blackrod, for Horwich Industrial Co-operative Society, Ltd.; Law & Grimshaw, architects, Bank Chambers, Atherton.

Ilminster.—Factory, for John James & Co., Ltd., Wood Street, Woolwich, London, S.E.18.

Inverness.—Modern ballroom (£10,000), for North British Hotels, Ltd.; manager, Caledonian Hotel.

Irish Free State.—(DUBLIN).—Rebuilding students' quarters, Rotunda Hospital, for the Board of Governors; F. G. Hicks, architect, 85, Merrion Square, Dublin. (GRANGEGORMAN, DUBLIN).—Nurses' home to mental hospital, Grangegorman, for the Joint Committee of Management; V. Kelly, architect, 87, Merrion Square, South, Dublin. (MONAGHAN, Co. MONAGHAN).—Hospital premises, for the Joint Committee of Management of the Monaghan Mental Hospital, Courthouse, Cavan, County Cavan; Cormac T. McLynn, architect, and Nicholas O'Dwyer, consulting engineer, Veritas House, Lower Abbey Street, Dublin.

Kent.—School, Angley Road, Cranbrook, for the County E.C.; county architect, Springfield, Maidstone.

Kidderminster.—Extensions to factory, for Victoria Carpet Co., Green Street.

Lancashire.—School, Bridge Lane, Netherton, near Liverpool, for the E.C.; S. Wilkinson, county architect, County Offices, Preston.

Lancaster.—Bus station (£13,950); borough engineer.

Lichfield.—Extensions to factory, for Chamberlain & Hill, Beacon Street.

London.—(DEPTFORD).—Oil refinery factories and extensions to western side and eastern side of Addey Street, for the Medina Refinery, Ltd., Sun wharf, Creek Street, Deptford, S.E.8. (LEWISHAM).—School, Whitefoot Lane (£36,585); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (STREATHAM).—Extensions to Furzedown training college (£48,633); W. H. Gaze and Sons, Ltd.

Longton (STAFFORDSHIRE).—Houses (86), Wood Street; Simcock & Clewes.

Luton.—Extensions and alterations to Beech Hill senior school; J. W. Tomlinson, borough engineer, Town Hall.

Lymington.—Men's and Women's wards, at the Lymington and District Cottage Hospital; Rashley & Co., contractors, High Street.

Manchester.—Houses (34), French Barn Lane, Fotherby Drive and Hill Lane, Blackley; Wilbraham Building Co., 174, Church Street, Urmston. Houses, Wavertree Road, Warrington Road and Wilma Avenue, Blackley, for F. Ward "Penrhos," Russell Street, Heaton Park; Roberts, Wood & Elder, architects, 26, Kind Street. School, Booth Hall estate, Blackley, for E.C.; Surveyor's Department, Education Offices, Deansgate. Shops, Greenwood Road and Hollyhedge Road; city architect.

Meriden.—Houses (54), Hazelhurst Road, Farm estate; R. Burfell, Ltd., Castle Bromwich.

Middlesbrough.—Cinema; Cussins (Contractors), Ltd., builders, Gosforth, Northumberland.

Middleton.—Houses (38), Tonge Vale Mill site; W. Kayley, engineer, Chancery Lane, Ardwick, Manchester. School, Alkrington estate; P. Howard, 88, Mosley Street, Manchester.

Newcastle-on-Tyne.—Extensions to works for Hodgson & Co.; Cackett, Burns Dick & McKellar, architects, 21, Ellison Place. Rebuilding timber works, Skinnerburn Street (£30,000), for J. Herring & Co.

Norwich.—School, Catton (£25,237), for the E.C.; Education Stores and Works department.

Oldbury.—Cinema (£35,000), Birmingham-Wolverhampton Road; T. Elvins & Son, builders, Soho Hill, Birmingham. Factory and offices, Wolverhampton Road, for Titford Property Co., New Road, Langley.

Oxford.—Casual wards, &c., Langford Lane Institution; Hinkins & Frewin, Ltd., Canal Street, Oxford.

Peeblesshire.—Reconstruction of West Linton school (£10,000), for the County E.C.; architect, County Buildings, Peebles.

Redditch.—Factory, Ipsley, for the Birmingham Small Arms Co., Ltd., Small Heath.

Roxburghshire.—School, Kelso (£60,000), for the C.C.; architect, County Offices, Newtown St. Boswells.

Salford.—Extensions to factory, Langley Road, for Universal Metal Products, Ltd., Craven Street, Pendleton.

Sanderstead.—Houses (14), Ingham Close; H. Ryan, Ltd. Additions to St. Anne's College, Sanderstead Road; governors.

Sheffield.—Flats (64), Edward Street clearance area; W. G. Davies, city architect, Town Hall.

South Shields.—Cinema, for T. H. Pailor; W. Pearson & Son, builders, Stranton, West Hartlepool.

Staffordshire.—School, Barlaston, for the County E.C.

Stockton-on-Tees.—Houses (24), Elcoat Street and Beaconsfield Road; Kendrews, Ltd., builders, Norton House estate. School and caretaker's house, Junction Road, Norton; borough engineer's office, Victoria Buildings.

Stoke-on-Trent.—Houses (18), Weston Coyney Road; Foreman & Thorley.

Stourport.—Houses (31), Bewdley Road; H. Matthews, builder, Baldwin Road, Kidderminster.

Sunderland.—Houses (14), Barnes Park Road; Parker & Sumby, builders. Houses (24), Fulwell Road; J. Prentice, builder, 15, St. Nicholas' Avenue. Flats (108), High Street East, for North-Eastern Housing Association; J. E. Lewis, borough engineer, Town Hall.

Swanscombe.—Cinema, Ames Road, for Ward Theatres, Ltd., Regent Street, London, W.1.

Talgarth.—Houses (28), for Hay R.D.C.; H. Skyrme, Council architect, 138, Widemarsh Street, Hereford.

Truro.—Furniture stores; Pickford, Ltd.

Twickenham.—Flats (110), and garages, Cambridge estate, Cambridge Road; G. T. Crouch, Ltd., Thames Street, Kingston-on-Thames.

Waddon.—Factory, Progress Way; Bailey Meters, Ltd.

Wallsend-on-Tyne.—Hotel, Coast Road, for Calders (Newcastle), Ltd.; R. W. Bell & Co., builders, 4, Grantham Road, Newcastle-on-Tyne, 2.

Walsall.—Cinema, Bescot Road, for Clifton Cinema Co., of Birmingham.

Wanstead.—Houses (110), Roding Farm estate; Estate Co.

Windsor.—Houses (32), Kenton's Lane (£10,396); Cain & Co., contractors, Hounslow.

Wolverhampton.—Houses (30), Church Road, Oxley; L. C. Lymer. Houses (160), Moreton estate, Oxley; E. A. Colman. Houses (21), Rutland Avenue; A. M. Griffiths & Son, Ltd. Houses (14), Southfield Grove; W. Vaughan. Block of shops and flats, Radnor Road, Bushbury; M. A. Boswell, builders. School Street, Wolverhampton. Extension to factory, Stafford Road; Goodyear Tyre Co., Ltd.

Worcester.—School (£27,000), Catshill; J. & A. Brazier, Ltd., builders, Bromsgrove.

Worsborough (BARNSLEY).—Houses (158), Dowcroft estate; U.D.C. surveyor.

Yorkshire.—Enlargement of County Hall, Northallerton (£42,680); North Riding county architect.